EXHIBIT 2

Motiva Patents, LLC v. Sony Corporation et al
No. 9:18-cv-00180-JRG-KFG (E.D. Tex.) (Consolidated Lead Case)
Defendants' Invalidity Contentions – Exhibit A-1

Claim Chart Against U.S. Patent No. 7,292,151 ("'151 patent")

Charted Reference: U.S. Patent No. 6,162,123 to Thomas Woolston ("Woolston")

Woolston, filed on November 25, 1997, issued on December 19, 2000, qualifies as prior art to the '151 patent under at least 35 U.S.C. §102(b).

Woolston anticipates claims 1, 27-30 and 32 under 35 U.S.C. § 102(b).

U.S. Patent Application Publication No. 2005/0017454 to Endo et al. ("Endo") was filed on June 9, 2004 and claims priority to U.S. Provisional Application No. 60/477,214, which was filed on June 9, 2003. Endo therefore qualifies as prior art with regard to the '151 patent under at least 35 U.S.C. § 102(e).

U.S. Patent Application Publication No. 2001/0034257A1 to Weston et al. ("Weston") published on October 25, 2001 and qualifies as prior art to the '151 patent under at least 35 U.S.C. §102(b).

U.S. Patent No. 5,667,220 to Cheng ("Cheng") issued on September 16, 1997. Cheng therefore qualifies as prior art with regard to the '151 patent under at least 35 U.S.C. § 102(b).

U.S. Patent No. 6,867,965 to Khoo ("Khoo") was filed on June 10, 2002 and therefore qualifies as prior art with regard to the '151 patent under at least 35 U.S.C. § 102(e).

Woolston in view of Endo/Weston renders claims 1, 27-30 and 32 obvious under 35 U.S.C. § 103(a).

Woolston (or Woolston in view of Endo/Weston) in further view of Cheng/Khoo renders claims 1, 27-30 and 32 obvious under 35 U.S.C. § 103(a).

The excerpts cited herein are exemplary. For any claim limitation, Defendants may rely on excerpts cited for any other limitation and/or additional excerpts not set forth fully herein to the extent necessary to provide a more comprehensive explanation for a reference's disclosure of a limitation. Where an excerpt refers to or discusses a figure or figure items, that figure and any additional descriptions of that figure should be understood to be incorporated by reference as if set forth fully therein.

Except where specifically noted otherwise, this chart applies the apparent constructions of claim terms as used by Plaintiff in its infringement contentions; such use, however, does not imply that Defendants adopt or agree with Plaintiff's constructions in any way.

To the extent the charted reference is held not to explicitly or inherently disclose any particular element below, such limitations were obvious for the reasons stated below and in Defendants' Invalidity Contentions, which are incorporated herein by reference.

Defendants are investigating this prior art and have not yet completed discovery from third parties who may have information concerning it. Defendants reserve the right to modify, amend and/or supplement these contentions as information becomes available, and as discovery proceeds.[1]

Claim 1

1[p] A system for tracking movement of a user, comprising:

To the extent that the preamble is limiting, it is disclosed or suggested by Woolston. For example, Woolston discloses a system for tracking movement of a user.

> An electro-mechanical device for providing an input to a computer program and said computer program providing a tactile output through said electromechanical device to a user. More specifically, the present invention provides an electro-mechanical virtual sword game apparatus that receives positional information from sensors on the sword apparatus and the sword apparatus contains a propulsion gyrostat that under the control of a computer process may be topple to provide a torque on the housing of the sword apparatus that may be used to simulate the impact of sword blows.

Woolston at Abstract.

> Yet another feature of the present invention is to use sensors, e.g., a receiver and/or a transmitter, on the sword apparatus and an array of sensors, e.g., receivers and/or transmitters, external and/or internal to the sword apparatus to determine the spatial attitude and/or location of the sword apparatus. In the preferred embodiment of the present invention the sword apparatus uses infrared blasters, e.g., high output infrared transmitters such as those found on modern universal remote television controls, to output a pulse and/or timed emission of infrared light which may then be received at the remote sensors, which in the preferred embodiment are infrared receivers, whereupon the timing and/or phase differential of the received signals may be used to triangulate and determine the spatial position of the sword apparatus. An infrared output at both the top and the bottom of the sword apparatus may be used to determine the attitude of the sword apparatus and is within the scope of the present invention.
>
> Game play and/or game plot may be used to encourage the player to maintain the sword apparatus within a predetermined field of play. For example, if the gaming program determines that the sword apparatus is positioned near the edge of a predetermined game field, the game software of the present invention may produce a virtual attack and/or event on the

[1] To the extent Plaintiff has asserted that a claim element is a software limitation under section 3(a)(i) of Judge Gilstrap's discovery order, no inference is intended, nor should any be drawn, that Defendants agree with or concede that assertion. Pursuant to section 3(a)(ii) of Judge Gilstrap's discovery order, Defendants reserve the right to supplement their invalidity contentions.

> player from the center and/or opposite side of the game field to encourage the player to move the sword apparatus toward the "center" of the predetermined game field. It is understood the that the game of the present invention may also use a "mysterious" force feature, discussed further below, to encourage the player to move the sword apparatus toward the center of the predetermined game field.

Id. at 3:46-4:19.

See also, id. at 2:36-44.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"tracking and processing movement, position, and orientation"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

See also following limitations.

1(a) a first communication device comprising

This limitation is disclosed or suggested by Woolston. For example, Woolston discloses a player interface apparatus, which is a first communication device. The first communication device communicates with a game controller.

> The present invention is an electronic game with interactive input and output through a new, novel and non-obvious player interface apparatus. The new player interface apparatus may be a hand held apparatus that may use sensors to determine the position of the apparatus and the gyrostatic effect to provide tactile feedback to the user. More particularly, in one embodiment of the present invention, the apparatus may be used in conjunction with software to create an electronic interactive sword game. In the sword type embodiment of the present invention, the hand held apparatus is preferably about the size of a three and/or four D-size cell battery flashlight and is adapted to be held by either one and/or two hands.

Id. at 2:36-48.

> In another embodiment of the present invention, other virtual representations of the virtual instrument that is representative of the object held by the player are within the scope of the present invention such as a gun, bazooka, knife, hammer, axe and the like and the gyrostat propulsion instrumentality of the present invention may be controlled accordingly to provide the appropriate feedback to simulate the virtual instrument. For example, in the gun and/or pistol embodiment of the present invention the gyrostat feedback means may be used to simulate events such as the "kick" from a gun, or the "crush" of a hammer blow.

Id. at 3:35-45.

> *Block 499 may represent the circuit board for the control circuits of the present invention. Control circuits 499 may have a suitable communication means such as a USART and/or ethernet and/or universal serial bus interface to receive data signals from the game controller 240. It is within the scope of the present invention to use external circuits and use analog controls signals and/or wireless analog and/or digital control signal to provide an interface between the sword apparatus and the game controller 240. In the preferred embodiment of the present invention, circuits 499 may contain a suitable protocol communications device or procedure to establish communications between the sword device and game controller 240. Circuits 499 may also contain the processing elements necessary for control and/or execution of software and/or software elements to effect control of the sword apparatus of the present invention. The control functions and/or part or parts of the control function may be moved into the game controller 240.*

Id. at 6:46-63.

See also, id. at Figs. 1-3.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"communication device, including a transmitter"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

1(a)(i) a transmitter for transmitting signals,

This limitation is disclosed or suggested by Woolston. For example, Woolston's first communication device includes a transmitter for transmitting signals.

> Yet another feature of the present invention is to use sensors, e.g., a receiver and/or a transmitter, on the sword apparatus and an array of sensors, e.g., receivers and/or transmitters, external and/or internal to the sword apparatus to determine the spatial attitude and/or location of the sword apparatus. In the preferred embodiment of the present invention the sword apparatus uses infrared blasters, e.g., high output infrared transmitters such as those found on modern universal remote television controls, to output a pulse and/or timed emission of infrared light which may then be received at the remote sensors, which in the preferred embodiment are infrared receivers, whereupon the timing and/or phase differential of the received signals may be used to triangulate and determine the spatial position of the sword apparatus.

Id. at 3:55-4:1.

> FIG. 1 shows a cross sectional profile of one configuration of the sword game of the present invention. Sword housing 200, power supply 900, power supply cord 910, data link to game controller 510, control logic 499, voltage control circuits for the motors and sensor inputs 400, gyrostat

> position detector circuit and positional gyroscope 600, safety switch 201, safety switch lever 202, propulsion gyroscope device 500, Speaker 203, infrared receivers and/or blasters 300, 302 and 304.

Id. at 5:25-35.

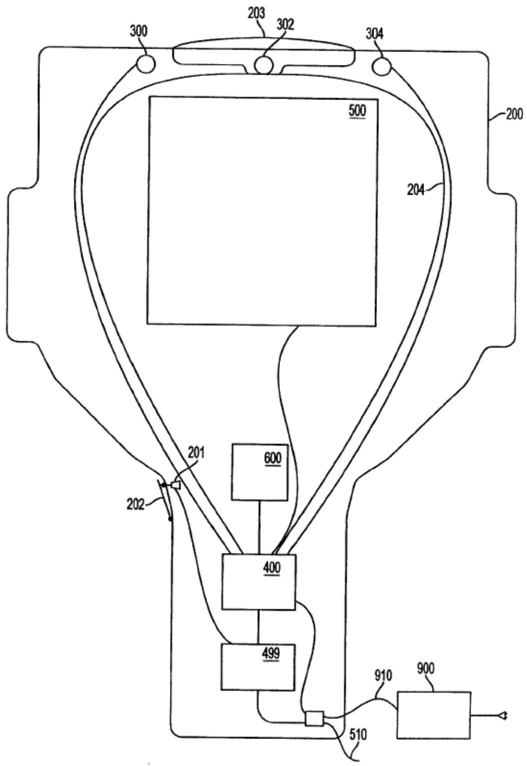

FIG. 1

Id. at Fig. 1.

> The circular devices depicted at 300, 302 and 304 may be either infrared receivers or infrared blasters or transmitters. These sensors and more, not shown, may extend around housing 200 to detect the position of a sword and/or the spatial coordinates of X, Y and Z as is denoted and further discussed in FIG. 3.

Id. at 7:26-31.

> Block 499 may represent the circuit board for the control circuits of the present invention. Control circuits 499 may have a suitable communication means such as a USART and/or ethernet and/or universal serial bus interface to receive data signals from the game controller 240. It is within the scope of the present invention to use external circuits and use analog controls signals and/or wireless analog and/or digital control signal to provide an interface between the sword apparatus and the game controller 240. In the preferred embodiment of the present invention, circuits 499 may contain a suitable protocol communications device or procedure to establish communications between the sword device and game controller 240.

> Circuits 499 may also contain the processing elements necessary for control and/or execution of software and/or software elements to effect control of the sword apparatus of the present invention. The control functions and/or part or parts of the control function may be moved into the game controller 240.

Id. at 6:46-63.

See also, id. at Fig. 3.

In the alternative, it would have been obvious to a PHOSITA to implement Woolston's wireless interface using a Bluetooth or other wireless transceiver as taught by Endo. See, Exhibit A-3 at Claim 1(a)(i). Endo teaches a similar interactive gaming system including a hand-held game apparatus shaped like a piece of sports equipment, such as a sword. Id. *The game apparatus communicates with a remote processor running game software using a Bluetooth or other wireless transceiver (i.e., transmitter and receiver).* Id. *A PHOSITA would have been motivated to implement Woolston's wireless interface using a well-known, predictable Bluetooth or other wireless transceiver as taught by Endo. Such a simple substitution of one known element for another would predictably result in wireless communications between Woolston's first communication device and the game controller 240.*

In the alternative, it would have been obvious to a PHOSITA to implement Woolston's wireless interface using a wireless transceiver as taught by Weston. See, Exhibit A-5 at Claim 1(a)(i). Weston teaches a similar interactive gaming system including a hand-held game apparatus. Id. *The game apparatus communicates with a remote processor running game software using a wireless transceiver (i.e., transmitter and receiver).* Id. *A PHOSITA would have been motivated to implement Woolston's wireless interface using a well-known, predictable wireless transceiver as taught by Weston. Such a simple substitution of one known element for another would predictably result in wireless communications between Woolston's first communication device and the game controller 240.*

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"communication device, including a transmitter"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

1(a)(ii) a receiver for receiving signals

This limitation is disclosed or suggested by Woolston. For example, Woolston's first communication device includes a receiver for receiving signals.

> Yet another feature of the present invention is to use sensors, e.g., a receiver and/or a transmitter, on the sword apparatus and an array of sensors, e.g., receivers and/or transmitters, external and/or internal to the sword apparatus to determine the spatial attitude and/or location of the sword apparatus.

Woolston at 3:55-60.

> FIG. 1 shows a cross sectional profile of one configuration of the sword game of the present invention. Sword housing 200, power supply 900, power supply cord 910, data link to game controller 510, control logic 499, voltage control circuits for the motors and sensor inputs 400, gyrostat position detector circuit and positional gyroscope 600, safety switch 201, safety switch lever 202, propulsion gyroscope device 500, Speaker 203, infrared receivers and/or blasters 300, 302 and 304.

Id. at 5:25-35.

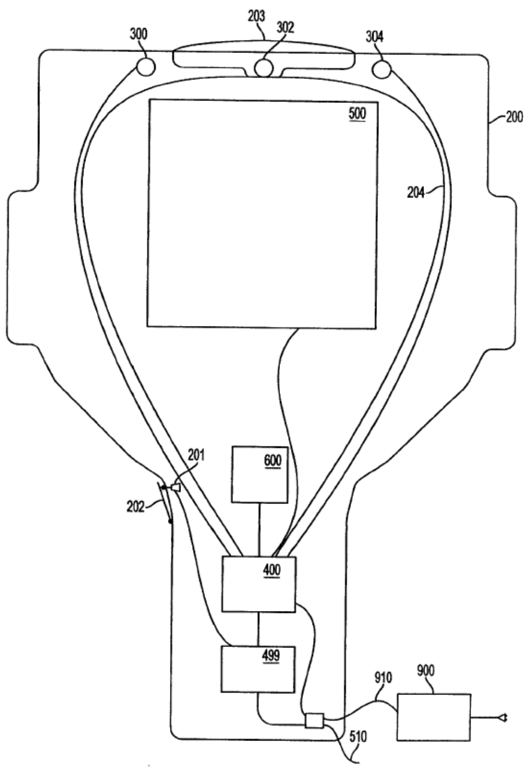

FIG. 1

Id. at Fig. 1

> Block 499 may represent the circuit board for the control circuits of the present invention. Control circuits 499 may have a suitable communication means such as a USART and/or ethernet and/or universal serial bus interface to receive data signals from the game controller 240. It is within the scope of the present invention to use external circuits and use analog controls signals and/or wireless analog and/or digital control signal to provide an interface between the sword apparatus and the game controller 240. In the preferred embodiment of the present invention, circuits 499 may contain a suitable protocol communications device or procedure to establish communications between the sword device and game controller 240. Circuits 499 may also contain the processing elements necessary for control and/or execution of software and/or software elements to effect control of the sword apparatus of the present invention. The control functions and/or

> part or parts of the control function may be moved into the game controller 240.

Id. at 6:46-63.

See also, id. at Fig. 3.

In the alternative, it would have been obvious to a PHOSITA to implement Woolston's wireless interface using a Bluetooth or other wireless transceiver as taught by Endo. See, Exhibit A-3 at Claim 1(a)(ii). Endo teaches a similar interactive gaming system including a hand-held game apparatus shaped like a piece of sports equipment, such as a sword. Id. *The game apparatus communicates with a remote processor running game software using a Bluetooth or other wireless transceiver (i.e., transmitter and receiver).* Id. *A PHOSITA would have been motivated to implement Woolston's wireless interface using a well-known, predictable Bluetooth or other wireless transceiver as taught by Endo. Such a simple substitution of one known element for another would predictably result in wireless communications between Woolston's first communication device and the game controller 240.*

In the alternative, it would have been obvious to a PHOSITA to implement Woolston's wireless interface using a wireless transceiver as taught by Weston. See, Exhibit A-5 at Claim 1(a)(ii). Weston teaches a similar interactive gaming system including a hand-held game apparatus. Id. *The game apparatus communicates with a remote processor running game software using a wireless transceiver (i.e., transmitter and receiver).* Id. *A PHOSITA would have been motivated to implement Woolston's wireless interface using a well-known, predictable wireless transceiver as taught by Weston. Such a simple substitution of one known element for another would predictably result in wireless communications between Woolston's first communication device and the game controller 240.*

To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the ***"receiver"*** *references identified in the Invalidity Contentions, which also identify rationale for the combination.*

1(a)(iii) an output device,

This limitation is disclosed or suggested by Woolston. For example, Woolston's first communication device includes an output device including a gyrostatic propulsion device and a speaker.

> Contained within the sword housing is a gyrostatic propulsion device from which the gyrostatic toppling effect is utilized to create a torque and/or the feel of sword blows on the sword handle and, thus, on the player holding the sword apparatus.
> In overview, one or more gyrostat(s) inside the sword apparatus may be used as the "propulsion" gyrostat, hereinafter, the "propulsion gyrostat." The propulsion gyrostat may be configured with a relatively "large" mass flywheel and a high speed electric motor to spin the flywheel and, thus, provide a source of gyrostatic power. The flywheel of the propulsion

> gyrostat may be configured in a double gimbal housing wherein each axis of freedom, for example, the pitch and yaw of the flywheel, may be controlled by high torque electric motors. By applying the appropriate voltage to the high torque motors, the propulsion gyrostat may be "toppled" in such a way as to create a calibrated torque on the whole sword apparatus, e.g., the sword housing. This calibrated torque may be used to simulate, inter alia, a sword blow as felt at a sword's handle. Through the interaction of successive sword blows, e.g., torque provided by the propulsion gyrostat to provide the "feel" of sword blows, and interactions with virtual swordsman opponents, the present invention provides a novel and exciting interactive sword game that physically involves the player interactivity with the game.

Woolston at 2:50-3:8.

> Economical high torque motors are found in many common children's toys such as radio controlled cars and other devices. It is understood, that the present invention may have a gyrostat of sufficiently high mass and may be "spun" at a sufficiently high speed in order to convey to the player, through the gyrostatic toppling effect, the desired tactile game effect and/or torque on the player. The torque on the propulsion gyrostat may be a calibrated and/or variable force and, therefore, the effect may be a calibrated and/or variable force imparted to the player.

Id. at 4:20-29.

> FIG. 1 shows a cross sectional profile of one configuration of the sword game of the present invention. Sword housing 200, power supply 900, power supply cord 910, data link to game controller 510, control logic 499, voltage control circuits for the motors and sensor inputs 400, gyrostat position detector circuit and positional gyroscope 600, safety switch 201, safety switch lever 202, propulsion gyroscope device 500, Speaker 203, infrared receivers and/or blasters 300, 302 and 304.

Id. at 5:25-35.

> The sword housing 200 may be adapted to receive a speaker 203 to provide an audio output for game sounds. Speaker 203 may be connected by line 204 to control circuits 400. Control circuits 400 may contain a digital to analog converter to generate game sounds.

Id. at 6:41-45.

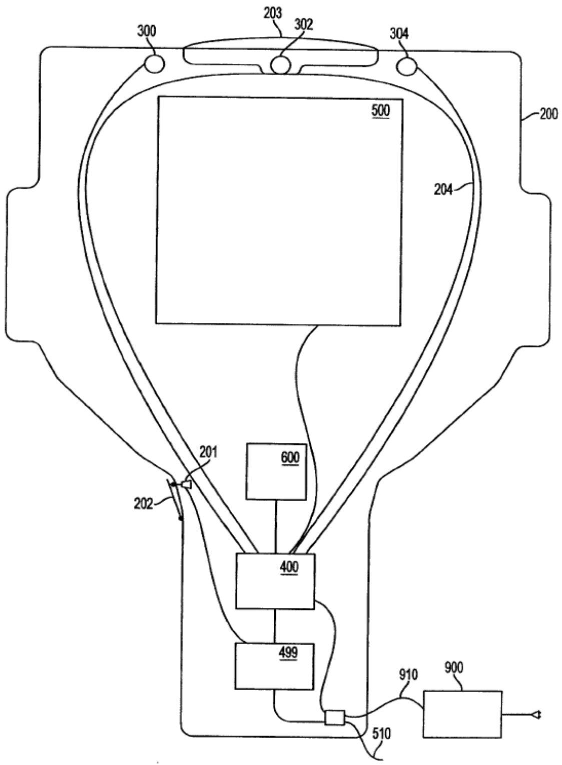

FIG. 1

Id. at Fig. 1.

See also, id. at 2:36-48, 7:32-8:64, 9:48-10:14, Figs. 2, 4.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"output device, providing sensory stimuli"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

1(a)(iv) said first communication device adapted to be hand-held;

This limitation is disclosed or suggested by Woolston. For example, Woolston's first communication device is adapted to be hand-held.

> The present invention is an electronic game with interactive input and output through a new, novel and non-obvious player interface apparatus. The new player interface apparatus may be a hand held apparatus that may use sensors to determine the position of the apparatus and the gyrostatic effect to provide tactile feedback to the user. More particularly, in one embodiment of the present invention, the apparatus may be used in conjunction with software to create an electronic interactive sword game. In the sword type embodiment of the present invention, the hand held

> apparatus is preferably about the size of a three and/or four D-size cell battery flashlight and is adapted to be held by either one and/or two hands.

Id. at 2:36-48.

> The game may be equipped with suitable straps, such as velcro straps and/or gloves, to maintain the sword within a player's hands and not allow the sword to flip out of a sword player's hands, much like a hand guard served in part, on traditional swords.

Id. at 7:21-26.

> Turning now to FIG. 10, sword apparatus 200 is shown in a player's hand 1000 in combat with a virtual sword 1002 and virtual opponent 1004. A virtual sword blade is shown at 1006 as idealized as extending from the sword apparatus 200 as may be viewed through virtual reality goggles on a player's 1000 eyes.

Id. at 15:58-63.

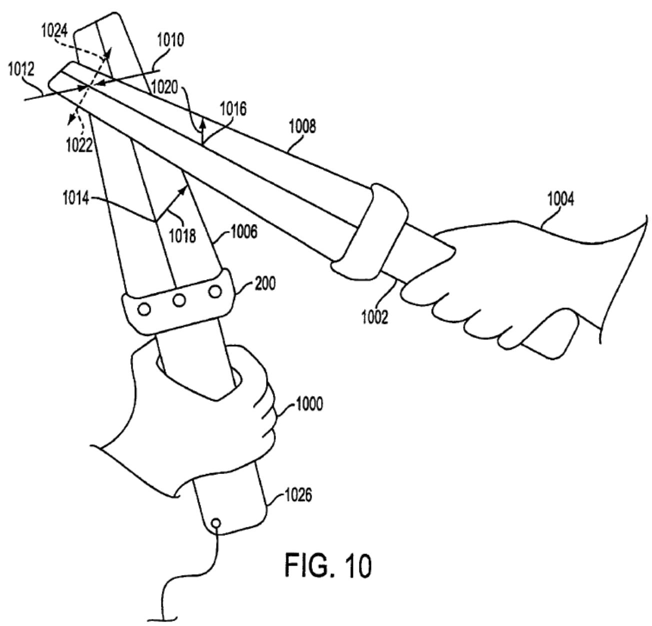

FIG. 10

Id. at Fig. 10.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"communication device, including a transmitter"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

1(b) a processing system,

This limitation is disclosed or suggested by Woolston. For example, Woolston discloses a game controller 240, which is a processing system.

> FIG. 3 shows the present invention in a deployment perspective showing a television and/or display 205 in a virtual reality and/or the game reality space can be projected 205 from game controller 240 in conjunction with sword housing 200. . . . It is understood that television 205 may be replaced with a suitable display such as a high definition television and/or a computer display and game controller may be embodied in personal computer software and/or a personal computer hardware apparatus and/or dedicated hardware.

Id. at 8:65-9:13.

See also, id. at Fig. 3, Fig. 9A.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"remote processing system, receiving and transmitting data"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

1(b)(i) remote from the first communication device,

This limitation is disclosed or suggested by Woolston. For example, Woolston's game controller 240 is remote from the first communication device.

> FIG. 3 shows a configuration of the present invention showing the game controller remote infrared blasters, television display, game controller and the sword device 200 of the present invention.

Id. at 5:38-41.

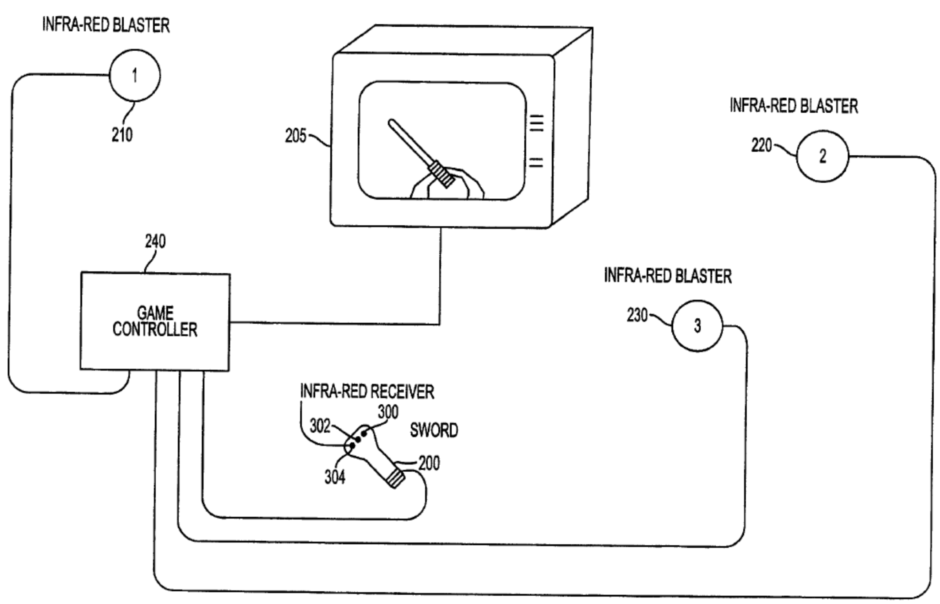

FIG. 3

Id. at Fig. 3.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"remote processing system, receiving and transmitting data"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

1(b)(ii) for wirelessly receiving said transmitted signals from said first communication device,

This limitation is disclosed or suggested by Woolston. For example, Woolston's game controller 240 wirelessly receives the transmitted signals from the first communication device. To the extent Motiva alleges this limitation is not expressly disclosed, it is inherently present. A PHOSITA would understand that the game controller necessarily wirelessly receives the signals transmitted from the first communication device via its wireless interface.

> Block 499 may represent the circuit board for the control circuits of the present invention. Control circuits 499 may have a suitable communication means such as a USART and/or ethernet and/or universal serial bus interface to receive data signals from the game controller 240. It is within the scope of the present invention to use external circuits and use analog controls signals and/or **wireless analog and/or digital control signal to provide an interface between the sword apparatus and the game controller 240**. In the preferred embodiment of the present invention, circuits 499 may contain a suitable protocol communications device or procedure to establish communications between the sword device and game controller 240. Circuits 499 may also contain the processing elements necessary for control and/or execution of software and/or software elements to effect control of the sword apparatus of the present invention. The control functions and/or part or parts of the control function may be moved into the game controller 240.

Id. at 6:46-63 (emphasis added).

In the alternative, it would have been obvious to a PHOSITA to implement Woolston's wireless interface using a Bluetooth or other wireless transceiver as taught by Endo. See, *Exhibit A-3 at Claim 1(b)(ii). Endo teaches a similar interactive gaming system including a hand-held game apparatus shaped like a piece of sports equipment, such as a sword.* Id. *The game apparatus communicates with a remote processor running game software using a Bluetooth or other wireless transceiver (i.e., transmitter and receiver).* Id. *A PHOSITA would have been motivated to implement Woolston's wireless interface using a well-known, predictable Bluetooth or other wireless transceiver as taught by Endo. Such a simple substitution of one known element for another would predictably result in wireless communications between Woolston's first communication device and the game controller 240.*

In the alternative, it would have been obvious to a PHOSITA to implement Woolston's wireless interface using a wireless transceiver as taught by Weston. See, Exhibit A-5 at Claim 1(b)(ii). Weston teaches a similar interactive gaming system including a hand-held game apparatus. Id. *The game apparatus communicates with a remote processor running game software using a wireless transceiver (i.e., transmitter and receiver).* Id. *A PHOSITA would have been motivated*

to implement Woolston's wireless interface using a well-known, predictable wireless transceiver as taught by Weston. Such a simple substitution of one known element for another would predictably result in wireless communications between Woolston's first communication device and the game controller 240.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"wireless"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

1(b)(iii) said processing system adapted to determine movement information for said first communication device and

This limitation is disclosed or suggested by Woolston. For example, Woolston's processing system runs game software adapted to determine movement information for the first communication device.

> Another feature of the present invention is to have a macro gyroscopically powered inertia navigational means on-board the hand held device. Such a small appparatus [sic] is available from Sony Corporation. The gyroscopic inertial positioning system may keep the computer game apprised of the spatial attitude and/or location of the sword apparatus in such a way that the game may provide the proper moments of torque on the motors to provide feedback to the player.

Woolston at 3:46-53.

> FIG. 5 shows a block diagram of the calculate blow routine which among other things, is a routine called from the game software to calculate the severity of a sword blow.

Id. at 5:44-46.

> FIG. 5 shows a block diagram representing a procedure that may be used to calculate a simulated sword blow. This routine may make the initial calculation for the torque force to be applied to the pitch and yaw motor drives at outputs 404 and 406. The calculate blow routine 520 may be called when an "attacking" sword and/or other virtual object(s) comes into contact with the calculated position for the player's virtual embodiment of the sword. The calculate blow routine 520 routine may receive an impact point in the x, y, and z coordinates of the virtual space and when applicable the attacking sword velocity. Block 522 labeled "get position sword hilt" is a routine that may retrieve the actual position of a player's sword apparatus 200 from sensor 600 and/or by the other means of sensors 300, 302 and 304. The retrieved hilt point may be used to determine the distance from the sword hilt that a sword impact occurred. This distance may, in turn, be used to determine the amount of leverage, e.g., the amount of "twisting force", that the attacking sword blow may have on the sword apparatus 200. The

next block 524 may calculate the sword's idealized mass. It is understood that more than one type of sword apparatus may be utilized, e.g., sword apparatus with different mass flywheels and/or rotational frequency, thus, the sword's idealized mass may be derived, at least in part, from a variable mass M, which may be the actual mass of the propulsion gyrostat and the variable omega which may be the instantaneous and/or present angular velocity and/or rotational frequency of the propulsion gyrostat. These two parameters may be used to determine the idealized mass and/or angular momentum of the propulsion gyrostat at any give time. Block 526 labeled "get sword velocity vector" may determine the sword velocity vector, e.g., the direction and speed of the sword, by successively determining the position of the player's sword and then determine from the change in position the velocity of the sword apparatus 200. The virtual sword may have an idealized and/or virtual mass that is different from the actual mass and/or inertial mass of the actual apparatus 200. For example, in one configuration the virtual mass may be represented and/or idealized as a heavy broad sword. Since a real broadsword may be a very heavy instrument, its virtual mass may also have a certain amount of momentum because of its idealized weight and velocity. The resultant of procedural blocks 524 and 526 is a vector providing the player's virtual sword direction and force at the impact point. The next procedural block 528 "get game sword position" yields a value from the game software, much like the resultant from procedural blocks described above, which provides the position of the sword hilt from the attacking virtual sword. Block 530 labeled "get game sword velocity vector" is a vector, from the game software, providing the velocity and virtual mass of the attacking sword, similar to procedural blocks 524 and 526 described above. Again, for example only, the virtual attacking sword may also have a virtual mass idealized from a fictionalized attacking broad sword. That is, once the heavy broad sword is in "motion", it may have a momentum from its mass and velocity. Procedural block 532 labeled "get game sword blow intensity" is the force of the attacking blow at the position of the strike. This may be calculated by the well known equation that force equals mass times acceleration and/or kinetic energy equals one half the mass times velocity squared. The results of procedural blocks 528, 530 and 532 is a vector providing the direction and force at the impact point of both the attacking virtual sword and the virtual sword projected from the player's sword apparatus 200. By taking the cross product of these vectors, the factors such as angle of the sword attack, how far from the hilt the strike may be taken into account when calculating the resultant vectors. Thus, procedural block 534 labeled "calculated blow/return blow torque vector" is a product of the two vectors, that is, the vector providing the player's sword direction and force at the impact point and the attacking sword vector providing the direction and force of the impact point idealized at right after impact. The product of the two vectors may provide the resulting direction and speed of the two swords by the calculation between two idealized objects when the equation for the conservation of momentum and/or energy is applied. That

> is m1v1+m2v2=m1v1 (t+1)+m2v2 (t+1). Thus, in this exemplary embodiment of the present invention the two swords may "bounce" off each other with an idealized impact. That is, there is no cushion or elasticity loss in the impact of the two idealized swords. However, elasticity factors as well as other means for calculating the resultant torque from a sword blow are within the scope of the present invention and may be accommodated by the insertion of loss constants in the energy conservative equations.

Id. at 10:21-11:40.

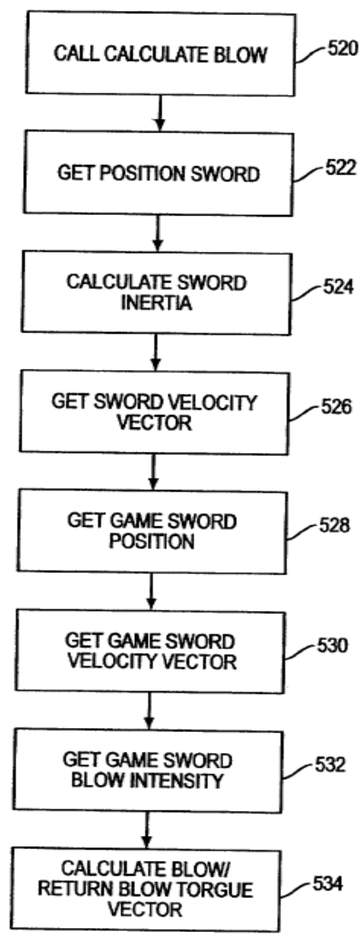

FIG. 5

Id. at Fig. 5.

> The game controller 240 may track the position and attitude of sword apparatus 200. The positional and attitude information may be used by the game controller software to project and track the virtual blade 1006. The game controller software 240 may determine and track the velocity of the blade 1006 by using the differential positioning method described above. The game controller 240 software may also create and track the position of blade 1006 in the game space coordinate system. The game controller 240

> may create and track the position of blade 1008. The game controller software may determine when the position information of blade 1006 and the position information of blade 1008 indicates a collision of the blades by tracking the area from line 1014 which has a radius 1018 and the area from line 1016 which has a radius 1020 and logically comparing the points to determine whether there is an intersection. When the game controller software determines there is an intersection the intersection point may be passed to the procedures described above in FIGS. 5, 6 and 7. In summary, a vector 1012 is determined that provides the force of the sword blow, for blade 1006, at the point of intersection. A vector 1010 is also determined providing the force of the attacking sword at the point of intersection. Through the use of the conservation of energy equations provided above, a resultant vector 1022 may be determined to provide the force vector for the resultant force at the point of intersection. The vector 1024 may also be calculated with the conservation of energy equations to provide the resultant force at the intersection point for the attacking sword 1002. The resultant force vector 1022 may be used in conjunction with the distance between the point of intersection and the sword hilt 1026 to approximate the torque generated at the point the player 1000 is gripping the sword apparatus 200. The torque is the distance times the force vector 1022. This torque output approximation may be used, inter alia, by the procedures described above to calculate the output torques and/or toppling force for the propulsion gyrostat. The above described procedures often use vectors and Cartesian coordinates to describe the present invention. Other coordinate systems such as spherical and cylindrical are also within the scope of the present invention.

Id. at 15:65-16:38.

See also, id. at 9:2-47, 11:41-15:28, Figs. 6-8.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"tracking and processing movement, position, and orientation"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

1(b)(iv) sending data signals to said first communication device for providing feedback or control data; and

This limitation is disclosed or suggested by Woolston. For example, Woolston's processing system sends data signals to the first communication device for providing feedback or control data.

> The present invention relates to interactive electronic games. More specifically, the present invention provides an apparatus in which a participant may input velocity and position information into an electronic game and receive physical feedback through the apparatus from the electronic game.

Id. at 1:4-9.

> The gyroscopic inertial positioning system may keep the computer game apprised of the spatial attitude and/or location of the sword apparatus in such a way that the game may provide the proper moments of torque on the motors to provide feedback to the player.

Id. at 3:49-53.

> Through the interactions of the procedures outlined in FIGS. 5, 6 and 7 a comprehensive output for motor controller 404 and 406 to control the propulsion gyrostat may be accomplished through these inter-related demands on the sword movement and/or interactions with the game plot and/or game play metaphor to give a player the incentive to conserve angular momentum of the sword apparatus 200. A comprehensive controller output is disclosed and allows sword apparatus 200 to be completely controlled by the game controller 240 at FIG. 3.

Id. at 15:19-28.

> 17. The apparatus of claim 1 further comprising a game controller, in communication with said controller, to transmit the game control signals to said controller.

Id. at 17:59-61.

See, also, id. at Figs. 5-8, 10:21-15:18.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"feedback data"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

1(c)(i) wherein said first communication device receives and processes said data signals from said processing system

This limitation is disclosed or suggested by Woolston. For example, the first communication device receives and processes data signals from the game controller.

> Block 499 may represent the circuit board for the control circuits of the present invention. Control circuits 499 may have a suitable communication means such as a USART and/or ethernet and/or universal serial bus interface to receive data signals from the game controller 240. It is within the scope of the present invention to use external circuits and use analog controls signals and/or wireless analog and/or digital control signal to provide an interface between the sword apparatus and the game controller 240. In the preferred embodiment of the present invention, circuits 499 may contain a suitable protocol communications device or procedure to establish communications between the sword device and game controller 240.

> Circuits 499 may also contain the processing elements necessary for control and/or execution of software and/or software elements to effect control of the sword apparatus of the present invention. The control functions and/or part or parts of the control function may be moved into the game controller 240.

Id. at 6:46-63 (emphasis added).

> FIG. 6 shows the call sword blow procedure which is used in conjunction with the procedures of FIG. 5 to calculate the actual values of the torque outputs for the pitch and yaw gyrostat toppling motors that provides the simulated impact of the sword at the player's sword apparatus 200. Procedural block 540 labeled "call sword blow" may denote the name of the software routine to perform the aforementioned torque output calculations. Turning now to the step by step procedural blocks, 542 labeled "get gyro position" may be from sensors 408 and 410 and may determine the attitude of the position of the propulsion gyrostat 10. This calculation may be important for the torque calculation because the gyrostatic force acts at a right angle to which the toppling force is applied. Thus, given that the desired torque effect for the sword apparatus is known from the calculation above, in general terms, the toppling torque applied to the propulsion gyrostat may be applied at a right angle to the propulsion gyrostat to achieve the desired torque effect. The next block 544 labeled "get gyro rotation" may be from sensor 418 and may indicate the angular velocity and/or rotational speed of the propulsion gyrostat 10. The next procedural block 546 labeled "get calibration factors" may provide operating parameters for the particular sword apparatus for which the torque output calculation is being determined. For example, as discussed above, a sword apparatus with two or more propulsion gyrostats is within the scope of the present invention. Also the mass of the propulsion gyrostat may be different for different sizes and models of the sword apparatus. Thus, block 546 may be utilized to retrieve the particular calibration factors for the particular sword apparatus for which the torque calculations are being calculated. It is understood that the calibration parameters may be encoded in a memory location associated with and/or within controller 401. It is also understood that in the preferred embodiment of the invention the actual inertial mass of the sword, which is the rotational frequency of the propulsion gyrostat times the mass of the propulsion gyrostat, may be greater than the virtual mass and/or idealized mass of the sword in order to provide excess torque and game action capacity for sword blows, e.g, at any given moment in game play the rotational frequency of the propulsion gyrostat may not be at the maximum rotational frequency and, therefore, the maximum torque effect on the sword apparatus may not be instantaneously available. The next procedural block 548 may calculate the value of the torque for output to controllers 404 and 406. This calculation may use the instantaneous inertial mass available, the desired torque amount and a compensating factor to resolve any non-linearities in the toppling motor response, as determined by conventional control systems principals, to calculate the output value. The

> sum of these torques may provide a toppling force at a right angle to the desired torque for the sword apparatus 200. The next procedural block 550 labeled "output impulse torque 1 and torque 2" are numerical value that may represent a value for eventual output to the toppling motors. In the preferred embodiment, these torque values are output to a predetermined memory location in controller 401 that, as will be discussed further below, are accessed by the gyrostat position control routine detailed in FIG. 7. It is understood that torque 1 and torque 2 may be a vector and/or an angular equation that takes into account the rotation of the propulsion gyrostat as torque is applied in order to translate what may be an angular torque output, due to the change in the angular position of the propulsion gyrostat, to translate the toppling force into a linear and/or straight line torque effect on the sword apparatus 200. Procedural block 552 labeled "gyro position control" denotes that the values of block 550 may be output to a memory location and/or data buffer and/or queue that will be accessed by the gyrostat position control routine detailed in FIG. 7. Procedural block 552 also provides that the call sword blow routine 540 may then terminate normally and exit and/or return.

Id. at 11:41-12:45.

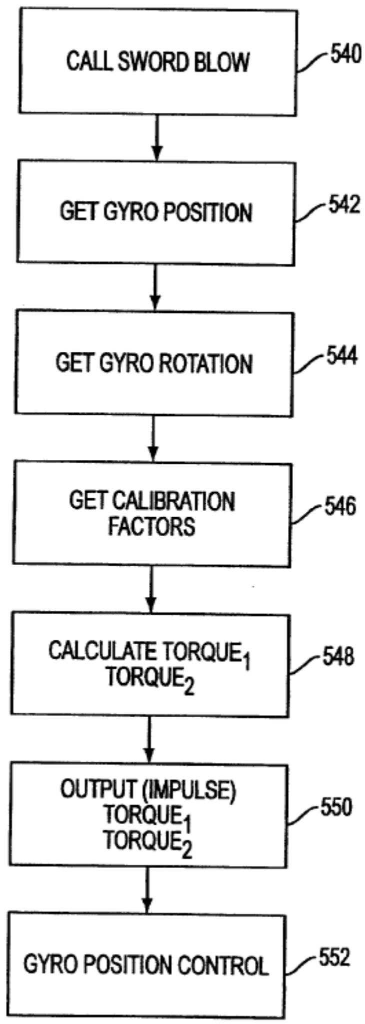

FIG. 6

Id. at Fig. 6.

> Through the interactions of the procedures outlined in FIGS. 5, 6 and 7 a comprehensive output for motor controller 404 and 406 to control the propulsion gyrostat may be accomplished through these inter-related demands on the sword movement and/or interactions with the game plot and/or game play metaphor to give a player the incentive to conserve angular momentum of the sword apparatus 200. A comprehensive controller output is disclosed and allows sword apparatus 200 to be completely controlled by the game controller 240 at FIG. 3.

Id. at 15:19-28.

See also, id. at 12:46-14:19, Fig. 7.

To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any

*of the **"receiver"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

1(c)(ii) and wherein the output device provides sensory stimuli according to the received data signals.

This limitation is disclosed or suggested by Woolston. For example, Woolston's gyrostatic propulsion device provides sensory stimuli in the form of tactile feedback according to the received data signals. The speaker also provides sensory stimuli in the form of game sounds according to the received data signals.

> Contained within the sword housing is a gyrostatic propulsion device from which the gyrostatic toppling effect is utilized to create a torque and/or the feel of sword blows on the sword handle and, thus, on the player holding the sword apparatus.
> In overview, one or more gyrostat(s) inside the sword apparatus may be used as the "propulsion" gyrostat, hereinafter, the "propulsion gyrostat." The propulsion gyrostat may be configured with a relatively "large" mass flywheel and a high speed electric motor to spin the flywheel and, thus, provide a source of gyrostatic power. The flywheel of the propulsion gyrostat may be configured in a double gimbal housing wherein each axis of freedom, for example, the pitch and yaw of the flywheel, may be controlled by high torque electric motors. By applying the appropriate voltage to the high torque motors, the propulsion gyrostat may be "toppled" in such a way as to create a calibrated torque on the whole sword apparatus, e.g., the sword housing. This calibrated torque may be used to simulate, inter alia, a sword blow as felt at a sword's handle. Through the interaction of successive sword blows, e.g., torque provided by the propulsion gyrostat to provide the "feel" of sword blows, and interactions with virtual swordsman opponents, the present invention provides a novel and exciting interactive sword game that physically involves the player interactivity with the game.

Id. at 2:50-3:8.

> The gyroscopic inertial positioning system may keep the computer game apprised of the spatial attitude and/or location of the sword apparatus in such a way that the game may provide the proper moments of torque on the motors to provide feedback to the player.

Id. at 3:49-53.

> Economical high torque motors are found in many common children's toys such as radio controlled cars and other devices. It is understood, that the present invention may have a gyrostat of sufficiently high mass and may be "spun" at a sufficiently high speed in order to convey to the player, through the gyrostatic toppling effect, the desired tactile game effect and/or torque on the player. The torque on the propulsion gyrostat may be a calibrated

> and/or variable force and, therefore, the effect may be a calibrated and/or variable force imparted to the player. It is understood that the fictitious "light saber" sword as popularized in the Star Wars™ fictionalized universe may be an appropriate metaphor for the game of the present invention. In the light saber metaphor, because a light saber is a fictional device, the game effects and/or game plot may be optimized to work in conjunction with the sword apparatus of the present invention. For example, the blow of crossing swords may use a calibrated and/or variable tactile feedback to the player where low energy storage in the propulsion gyrostat may be coordinated with game interaction such as allowing an opponent's sword to partially and/or completely pass through the players "light saber" defense. In another example, the light saber metaphor may allow the light saber virtual blade to strike through objects and, thus, may require a relatively small tactile feedback amount, thus, creating the illusion of a powerful virtual sword that can strike through objects. In contrast to a virtual medieval sword, wherein the steel blade cannot strike through all objects and, therefore, the striking of an object, such as a virtual tree, may require a massive tactile feedback response in order to "stop" the sword blow cold. Thus, the illusion of the medieval sword may be lost because of overloading, e.g., over draining of the rotational gyrostatic energy, the propulsion gyrostatic tactile feedback means of the present invention. That is not to say, of course, that a medieval sword embodiment is not within the scope of the present invention, for indeed it is as well as swords and blades of all types and sizes.

Id. at 4:20-56.

> Another interesting aspect of the present invention is the ability of the software to lead the players movements as well as provide impact feedback. A good example of this would be, again, the Star Wars™ metaphor where the player is told to "feel the force." The game of the present invention may apply a "mysterious force", discussed further below, which is essentially a small torque from the propulsion gyrostat whereby the sword device may "lead" the player's sword blows and/or movement.

Id. at 4:66-5:7.

> The sword housing 200 may be adapted to receive a speaker 203 to provide an audio output for game sounds. Speaker 203 may be connected by line 204 to control circuits 400. Control circuits 400 may contain a digital to analog converter to generate game sounds.

Id. at 6:58-63.

> Block 582 outputs torque voltages 1 and torque voltages 2 to torque motor controllers 404 and 406. These torque voltages are used to topple the propulsion gyrostat 10 of the present invention to provide the gyrostatic effect of the sword apparatus 200. Thus, for example, when the virtual sword is not impacting on a virtual object the output at block 582 may merely be the tracking torques from block 574 that attempts to topple the propulsion gyrostat so as to track the player's movement of sword apparatus

> 200. Thus, for example, when a sword blow torque is generated from the procedure described in FIG. 6, the dominant factor in the gyro effects calculation 580 and, therefore, the output at 582 may be the sword blow providing a strong output providing a strong torque at the sword apparatus 200. In a third example situation, the dominant force may be the "mysterious" force from FIG. 8, which will be discussed further below, which attempts to lead the player's sword movement through what may be subtle torque on the sword apparatus 200. The "mystery" torque may be strong or subtle on sword apparatus 200 depending on pre-programmed parameters.

Id. at 13:57-14:10.

> Turning back to FIG. 5, this routine may be configured so as to accept other factors that may effect the sword blow calculation, such as to accommodate for when the sword apparatus 200 for the virtual sword apparatus passes through an object in the game domain such as a tree or wall that as previously discussed in the light saber metaphor and thereby may allow the sword to pass through or strike through while providing some tactile feedback to the sword apparatus 200 denoting the striking through of an object. This may be accomplished by reducing the sword blow intensity factor to provide an impulse from an object, e.g., idealized as a very small virtual mass, that may allow the sword apparatus idealized momentum to strike through the object. That is, the conservation of momentum equations may allow the virtual sword to follow through an object when the object struck has a small mass relative to the virtual sword mass.

Id. at 15:3-18.

See also, id. at Fig. 7.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"output device, providing sensory stimuli"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

Claim 27

27. A system according to claim 1, further comprising:

See Claim 1.

27(a) a second communication device,

This limitation is disclosed or suggested by Woolston. For example, Woolston discloses a two-player mode including a second communication device.

> Another aspect of the present invention is the ability to network multiple game play stations to allow virtual sword fights between multiple players and/or the coordinated efforts of multiple participants. In a two player mode, conventional modem means may be used to connect game stations in a back-to-back configuration. Telemetry between the game stations may be used to convey positional, attitudinal and inertial mass, explained further below, of the respective sword devices between game stations. In another configuration, multiple players may network together with a server computer acting as the communication hub between multiple game stations.

Id. at 5:8-19.

> A network 708 is shown which may be a TCP/IP network such as the Internet. In the master configuration, the game station programmed as the master sends, receives and coordinates the information transfer from the "slave" configured stations. Information may be transferred between the stations using the communication data packet shown in FIG. 9B. The communication packet provides a terminal identification 750, position information for a sword apparatus 752, attitude information for a sword apparatus 754, velocity information for a sword apparatus 756, resultant force vector information 758 and sword parameter information 760. The slave configured game station may periodically send this information packet to the master configured game controller. The master configured game controller may in turn, use this information to generate a virtual opponent having a virtual sword representation that is mapped into the game space. The master configured game station may relay the information from a first slave configured game terminal to a second slave configured game terminal. The master configured game station coordinates the calculation of the resultant force vector for the slave configuration game station's control output. It is understood that data packet shown in 9B may be framed with the suitable protocol overhead and transparent bits.

Id. at 15:33-57

See also, id. at Fig. 9.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"second communication device"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

27(b) adapted to be hand held,

This limitation is disclosed or suggested by Woolston. For example, Woolston's second communication device is identical to the first communication device and is therefore adapted to be hand-held as discussed above with regard to limitation 1(a)(iv). See *Claim 1(a)(iv). In the alternative, it would have been obvious to a PHOSITA for Woolston's second communication device to be identical to the first communication device and therefore hand-held.*

To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the ***"communication device including a transmitter"*** *references identified in the Invalidity Contentions, which also identify rationale for the combination.*

27(c) in electrical communication with the first communication device,

This limitation is disclosed or suggested by Woolston. Per Motiva's interpretation of the claim, the second communication device is in electrical communication with the first communication device via the game controller.

> Another aspect of the present invention is the ability to network multiple game play stations to allow virtual sword fights between multiple players and/or the coordinated efforts of multiple participants. In a two player mode, conventional modem means may be used to connect game stations in a back-to-back configuration. Telemetry between the game stations may be used to convey positional, attitudinal and inertial mass, explained further below, of the respective sword devices between game stations. In another configuration, multiple players may network together with a server computer acting as the communication hub between multiple game stations.

Id. at 5:8-19.

> A network 708 is shown which may be a TCP/IP network such as the Internet. In the master configuration, the game station programmed as the master sends, receives and coordinates the information transfer from the "slave" configured stations. Information may be transferred between the stations using the communication data packet shown in FIG. 9B. The communication packet provides a terminal identification 750, position information for a sword apparatus 752, attitude information for a sword apparatus 754, velocity information for a sword apparatus 756, resultant force vector information 758 and sword parameter information 760. The slave configured game station may periodically send this information packet to the master configured game controller. The master configured game controller may in turn, use this information to generate a virtual opponent having a virtual sword representation that is mapped into the game space. The master configured game station may relay the information from a first slave configured game terminal to a second slave configured game terminal. The master configured game station coordinates the calculation of the resultant force vector for the slave configuration game station's control output. It is understood that data packet shown in 9B may be framed with the suitable protocol overhead and transparent bits.
> Turning now to FIG. 10, sword apparatus 200 is shown in a player's hand 1000 in combat with a virtual sword 1002 and virtual opponent 1004. A virtual sword blade is shown at 1006 as idealized as extending from the sword apparatus 200 as may be viewed through virtual reality goggles on a player's 1000 eyes. The opponent's sword 1002 opponent 1004 and

> opponent sword blade 1008 are, in this example, a virtual representation. The game controller 240 may track the position and attitude of sword apparatus 200. The positional and attitude information may be used by the game controller software to project and track the virtual blade 1006. The game controller software 240 may determine and track the velocity of the blade 1006 by using the differential positioning method described above. The game controller 240 software may also create and track the position of blade 1006 in the game space coordinate system. The game controller 240 may create and track the position of blade 1008. The game controller software may determine when the position information of blade 1006 and the position information of blade 1008 indicates a collision of the blades by tracking the area from line 1014 which has a radius 1018 and the area from line 1016 which has a radius 1020 and logically comparing the points to determine whether there is an intersection. When the game controller software determines there is an intersection the intersection point may be passed to the procedures described above in FIGS. 5, 6 and 7. In summary, a vector 1012 is determined that provides the force of the sword blow, for blade 1006, at the point of intersection. A vector 1010 is also determined providing the force of the attacking sword at the point of intersection. Through the use of the conservation of energy equations provided above, a resultant vector 1022 may be determined to provide the force vector for the resultant force at the point of intersection. The vector 1024 may also be calculated with the conservation of energy equations to provide the resultant force at the intersection point for the attacking sword 1002. The resultant force vector 1022 may be used in conjunction with the distance between the point of intersection and the sword hilt 1026 to approximate the torque generated at the point the player 1000 is gripping the sword apparatus 200. The torque is the distance times the force vector 1022. This torque output approximation may be used, inter alia, by the procedures described above to calculate the output torques and/or toppling force for the propulsion gyrostat.

Id. at 15:33-16:34.

See also, id. at Figs. 9A-B, 10.

Alternatively, it would have been obvious to a PHOSITA to enable communication between the first and second communication devices as taught by Weston. See, Exhibit A-5 at Claim 27(c). Weston teaches a similar interactive gaming system including first and second hand-held game apparatuses that wirelessly communicate directly with each other to enable users to send messages to each other. Id. *A PHOSITA would have been motivated to similarly enable Woolston's first and second communication devices to communicate directly with each other to similarly enable the user's to send messages thereby improving similar interactive game systems in the same way.*

Alternatively, it would have been obvious to a PHOSITA to enable electrical communication between the first and second communication devices as taught by Cheng. Cheng teaches a video game system where a user can use a first and second control unit that are connected electrically with each other and to a game console either via a wired connection or wirelessly. Cheng further

teaches that a first and second user can each operate one of the first and second control units. Cheng teaches that the first and second control unit can be individually replaced when a button is worn, such that the entire device does not need to be thrown away. A PHOSITA would have been motivated to implement Woolston's system using well-known, predictable adaptations to enable electrical communication between the first and second communication devices as taught by Cheng. Such a combination would have predictably added additional game functionality with buttons for a user to use while playing a video game. A PHOSITA would have understood that this combination of prior art elements according to known methods would have yielded predictable results. Furthermore, a PHOSITA would have understood that a simple substitution of wire 8 of Fig. 4 for a wireless transceiver, such as a Bluetooth transceiver, would have predictably enabled wireless communication between the control units and the game console while requiring only one transceiver instead of two transceivers, as depicted in Fig. 5 of Cheng. Such a simple substitution would have predictably yielded lower manufacturing costs for a wireless embodiment as a wire 9 would be cheaper to manufacture than a second transceiver. Such a simple substitution would have predictably reduced costs for a user when a control unit needs to be replaced, as taught by Cheng. Such a simple substitution would have the further benefit of predictably lowering power usage of the control units by powering only a single transceiver instead of two, which would have predictably increased battery life.

> Use of the aforementioned conventional controller with a video game console results in the following drawbacks:
> 1. Since all of the control buttons 15 are provided on the finger operating surface of the housing 14, and since the size of the housing 14 is relatively small, it is inconvenient for the user to operate the control buttons 15 simultaneously with his two hands. This situation is aggravated when the user has relatively big hands.
> 2. Since all of the control buttons 15 are provided on the finger operating surface of the housing 14, the entire conventional controller has to be replaced even though only one of the control buttons 15 is damaged after a period of use.

Cheng at 1:24-35.

> According to the present invention, a controller for a video game console includes first and second handheld control units. Each of the first and second handheld control units has a housing with a finger operating surface that is provided with a control button unit, and means for transmitting signals to the video game console when the control button unit is operated. An interconnecting means is provided for releasably interconnecting the housings of the handheld control units.

Id. at 1:48-54.

> *Referring to FIG. 2, the first preferred embodiment of a controller for a video game console (not shown) in accordance with the present invention includes first and second handheld control units, 3 and 4. Each of the control units, 3 and 4, has a housing 30,40 with a finger operating surface 31,41 which is provided with a control button unit. Each of the control button unit includes at least one control button 32,42. In the present*

> *embodiment, the control button unit of each of the control units 3,4 is shown to be provided with four control buttons 32,42.*
> Referring now to FIGS. 2 and 3, the controller of the present embodiment further includes a connector 80 which is adapted to be connected electrically to a processing unit (not shown) of the video game console. Each of the control units 3,4 further has a transmitting means (shown in phantom lines) which includes a cable (C1) having one end portion connected electrically to the control button unit thereof and an opposite end portion connected electrically to the connector 80 via a cable (C2) and which transmits signals to the processing unit of the video game console when the control buttons 32,42 are operated.

Id. at 2:42-62.

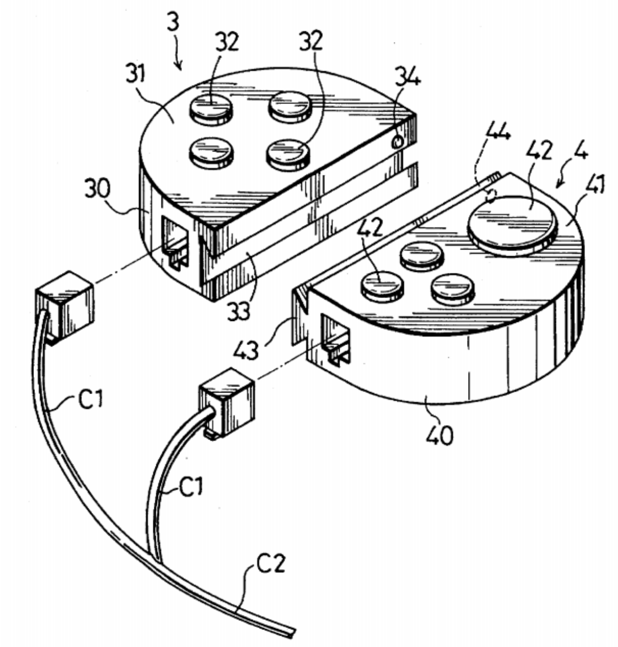

FIG. 2

Id. at Fig. 2.

> Referring to FIG. 4, a second preferred embodiment of the present invention is shown. In this embodiment, the transmitting means of the first control unit (3I) includes a first cable 9 having one end portion connected electrically to the control button unit thereof and an opposite end portion connected electrically to the control button unit of the second control unit (4I). The transmitting means of the second control unit (4I) includes a second cable 8 having one end portion connected electrically to the control button unit thereof and an opposite end portion connected electrically to the connector (80I).

Id. at 3:30-40.

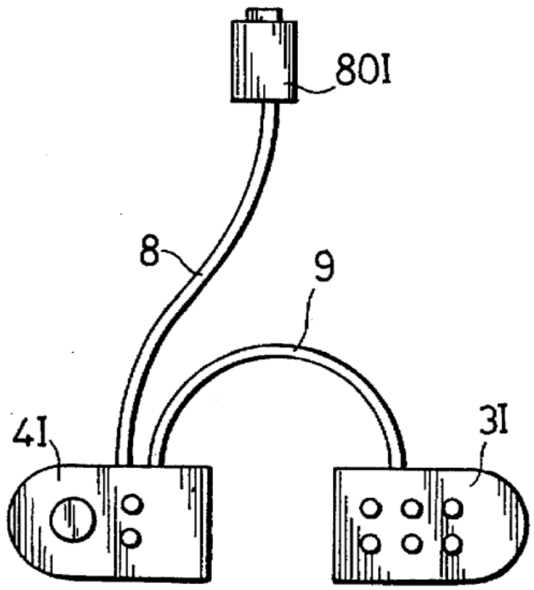

FIG. 4

Id. at Fig. 4.

> With reference to FIG. 5, a third preferred embodiment of the present invention is shown. In this embodiment, the transmitting means of each of the control units (3J,4J) includes a wireless radio signal transmitter (T) which is connected electrically to the respective control button unit and which transmits wireless radio signals when the control buttons (32J,42J) are operated. The controller further includes a wireless radio signal receiver (R) which receives the wireless radio signals from the wireless radio signal transmitter (T) and which is connected electrically to a connector (80J) that is adapted to be connected electrically to the processing unit of the video game console (82J) via a receptacle (81J).

Id. at 3:41-53.

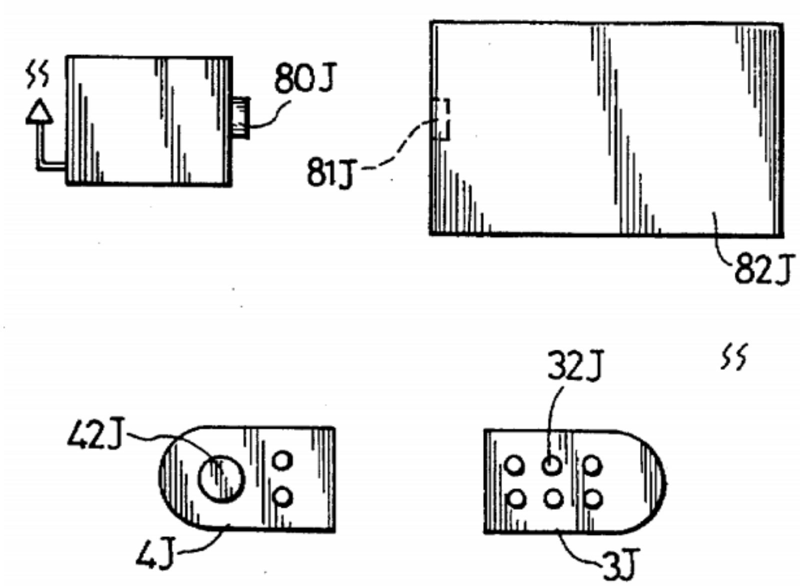

FIG.5

Id. at Fig. 5.

> Accordingly, the controller of the present invention has the following advantages:
> 1. The housings of the control units of the controller are separable in accordance with the user's needs, thereby enhancing flexibility of the controller when in use.
> 2. Only the control unit which has a damaged control button needs to be repaired, thereby minimizing the repair cost.
> 3. The controller of the present invention can be used with a conventional video game console by merely connecting the connector of the controller to a predetermined port of the conventional video game console.
> 4. Since the housings of the control units of the controller are separable, it is convenient for a more experienced user to assist a less experienced user in operating some of the control buttons.

Id. at 5:26-39.

Alternatively, it would have been obvious to a PHOSITA to enable communication between the first and second communication devices as taught by Khoo. Khoo teaches a first and second hand-held computing device communicating with each other and to a server computer. Khoo teaches that the first and second devices communicate with each other either by wired or wireless connection. A PHOSITA would have been motivated to implement Woolston's system using well-known, predictable adaptations to enable electrical communication between the first and second communication devices as taught by Khoo. Such a combination would have predictably added additional game functionality with buttons for a user to use while playing a video game. A PHOSITA would have understood that this combination of prior art elements according to known methods would have yielded predictable results.

> Because manufacturers have typically been more concerned with integrating functions in a single device, little development has been devoted to integrating the functionality of mobile phones and PDA devices as separate but cooperative devices. However, these devices share common elements, such as display screens, keypads, speakers, and microphones, that can be used together to form a single networked device. Such cooperative networking can result in a compound device that provides a higher degree of usability and convenience than the two devices provide separately. In this manner, the two devices can be virtually integrated into a single unitary device, to provide a greater ease of use than a single highly integrated device. Therefore, it is also desirable to provide a system of networking a mobile telephone type device and a PDA type device to produce a portable networked device that combines the features of both devices while allowing both to be used independently from one another.

Khoo at 2:1-18.

> A compound portable computing device comprising two or more separate portable devices coupled over a wireless link is described.

Id. at 2:22-24.

> Aspects of the present invention may be implemented on one or more portable computing devices executing software instructions. The portable computing devices may be pre-programmed stand-alone devices, or they may be networked to other computers or computing devices in a client/server network. According to one embodiment of the present invention, such a server and client computer system can transfer data over a computer network, standard telephone line, or wireless data link. The steps of accessing, downloading, and manipulating the data, as well as other aspects of the present invention are implemented by central processing units (CPU) in server and portable device client computers executing sequences of instructions stored in a memory. The memory may be a random access memory (RAM), read-only memory (ROM), a persistent storage, such as a mass storage device, or any combination of these devices. Execution of the sequences of instructions causes the CPU to perform steps according to embodiments of the present invention.

Id. at 3:24-42.

> FIG. 1 illustrates a client server computer network that can be used to implement embodiments of the present invention. In network 100, server computer 102 is coupled to the one or more remote client computing devices 104 and 105 over a network 110. Network 110 may be a Local Area Network (LAN), Wide Area Network (WAN), telecommunications network, the Internet, or any similar type of network for coupling a plurality of computing devices to one another.

> Server 102 transmits and receives digital data over network 110 from the one or more portable computing devices 104and 105. Such data may be video data, audio data, text data, or any combination thereof. The portable computing devices are generally hand-held, personal digital assistant ("PDA") devices 105, cell phones 104, data-enabled telephones ("SmartPhone"), or some other type of portable, hand-held network access device. Such devices may be coupled to network 110 over a wireless link.

Id. at 3:43-60.

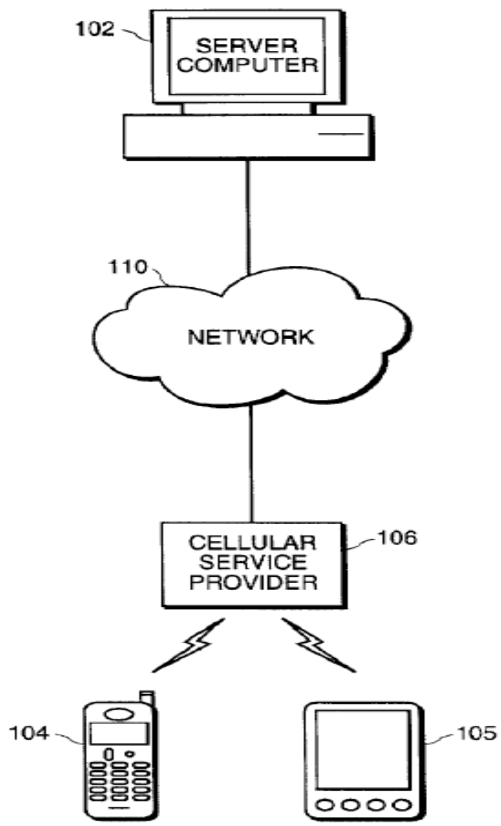

FIG. 1

Id. at Fig. 1.

> Although network 100 illustrates the portable client computing devices 104 and 105 as coupled to a server computer 102, it should be noted that these devices could be coupled to other communication devices or computers, over network 110.

Id. at 4:14-18.

> The mobile phone 202 and PDA 204 are coupled together over a link 214. This link allows the two devices to be used in together as an input and communication device.

Id. at 5:12-15.

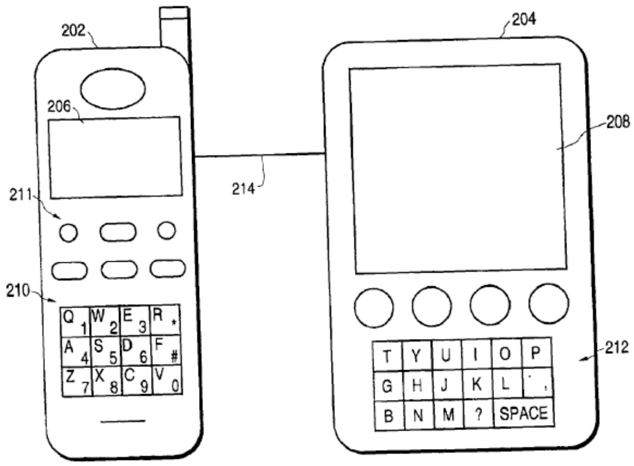

FIG.2A

Id. at Fig. 2A.

> Instead of a physical link between the devices, as illustrated in FIG. 2A, a wireless link may be employed to facilitate maximum flexibility and placement of the devices. FIG. 2Billustrates a preferred embodiment of the present invention in which the mobile phone 224 and PDA 225 are coupled together over a wireless link 216.

Id. at 5:20-25.

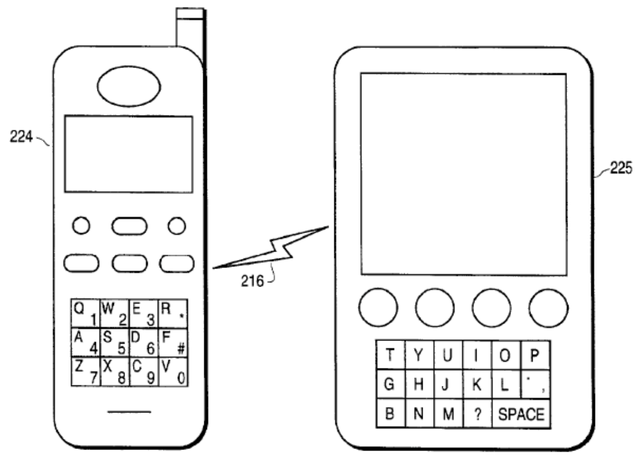

FIG.2B

Id. At Fig. 2B.

> Although FIG. 2B illustrates an embodiment in which the wireless interface between the two portable devices is a Bluetooth link, other embodiments can implement different wireless links, such as infrared communication, cell-based communication, and the like.

Id. at 11:8-12.

> As shown in FIG. 5, the keypads for the mobile phone and PDA devices of FIGS. 2A and 2B each access a partial keyboard map 514 or 516, as well as their own resident keyboard map 512. The partial keyboard maps allow the two independent keypads to operate in conjunction with one another to form a full keyboard. For the embodiment of the present invention illustrated in FIG. 2A, the mobile phone 104and PDA 105 are coupled to one another through a physical link 214. Physical link 214 may be a flexible electrical cable of varying and adjustable length. The keypads 210 and 212together form the input keyboard of the integrated device. The typed output may be displayed on either display 208 of the PDA, or display 206 of the phone, or it may be displayed on both displays together.

Id. at 8:4-17.

> As stated above, FIG. 2B illustrates a preferred embodiment of the present invention in which the mobile phone 224 and PDA 225 are coupled together over a wireless link 216. For the embodiment of FIG. 2B, both devices implement a wireless protocol that allows them to synchronize their operation and access common data and produce common output. One such wireless protocol is the Bluetooth protocol. Bluetooth is an industry consortium developed technology that defines specifications for small form factor, low-cost, low power consumption, short-range radio links between mobile personal computers, mobile phones and other portable devices. The

> Bluetooth core specification defines a protocol stack that includes a baseband and Link Manager Protocol that reside over a radio layer. The radio layer operates in a band extending from 2400 to 2483.5 MHz and uses spread spectrum communication. The baseband layer controls the radio and performs packet handling over the wireless link. Under the Bluetooth protocol, two types of links can be established, Synchronous Connection Oriented (SCO), and Asynchronous Connection Less (ACL). SCO links are used for synchronous data, such as voice data, while ACL links are for data transfer applications that do not require a synchronous link. The Link Manager Protocol performs network management functions, such as establishing ACL/SCO links, attaching/detaching slave devices, setting link parameters (power, quality, security, etc.), and other similar functions.
> For the embodiment of the invention illustrated in FIG. 2B, the mobile phone and PDA devices are both Bluetooth enabled devices that are configured to form a piconet. In a Bluetooth system, a piconet is a group of devices connected to form a common channel, which is identified with a unique frequency hop sequence. One of the devices, either the mobile phone 224 or the PDA 225 is the master, while the other device is the slave.

Id. at 8:18-52.

> In one embodiment of the present invention, the device that includes the left-hand side keys is configured to be the Bluetooth slave device, and the device that includes the right hand side keys, e.g., keypad 304 in FIG. 3A, is the Bluetooth master device. The two devices follow the standard Bluetooth procedures to establish a connection between them. Upon being placed in proximity with the other device, either the PDA or mobile phone automatically initiates an inquiry to find out what access points are within its range. If the other device is within range, it will respond with its address. The initiating device will then start a paging procedure in which the clock offset, frequency hop, and other initialization parameters are synchronized between the two devices.

Id. at 8:61-9:6.

> Once a link is established, the Link Manager Protocol within the initiating device utilizes a Service Discovery Protocol to determine what services are available from the access point device. In one embodiment of the present invention, the dual portion keyboard map is available as a service that is identifiable by the Service Discovery Protocol. This service allows the partial keyboard map to be loaded into active memory of the devices, and the input keystrokes to access corresponding keys within the keyboard map.

Id. at 9:11-20.

> For the embodiment in which the connection between the mobile phone and PDA is a hardwired link, as shown in FIG. 2A, the operation of the two portable computing devices is similar to that of the wireless embodiment described above. Instead of a wireless protocol, such as Bluetooth, a small-scale or local area network protocol may be used to coordinate data entry

> and communicate the keyboard entry data between the two devices. A keyboard map is loaded into the memory of both devices, and is used to translate the keystrokes entered into each device's partial keyboard into a common output. For network protocols that require the establishment of slave and master devices, the coordination between the devices can be accomplished as described with reference to the method of FIG. 4. For protocols that do not require a master/slave hierarchy, communication between the two devices can be implemented between the two devices as network peers.

Id. at 11:28-45.

To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the ***"in electrical communication with the other communication device"*** *references identified in the Invalidity Contentions, which also identify rationale for the combination.*

27(d) with the processing system adapted to determine movement information of the second communication device relative to the first communication device.

This limitation is disclosed or suggested by Woolston. For example, Woolston's processing system determines movement information of the second communication device relative to the first communication device.

> A network 708 is shown which may be a TCP/IP network such as the Internet. In the master configuration, the game station programmed as the master sends, receives and coordinates the information transfer from the "slave" configured stations. Information may be transferred between the stations using the communication data packet shown in FIG. 9B. The communication packet provides a terminal identification 750, position information for a sword apparatus 752, attitude information for a sword apparatus 754, velocity information for a sword apparatus 756, resultant force vector information 758 and sword parameter information 760. The slave configured game station may periodically send this information packet to the master configured game controller. The master configured game controller may in turn, use this information to generate a virtual opponent having a virtual sword representation that is mapped into the game space. The master configured game station may relay the information from a first slave configured game terminal to a second slave configured game terminal. The master configured game station coordinates the calculation of the resultant force vector for the slave configuration game station's control output. It is understood that data packet shown in 9B may be framed with the suitable protocol overhead and transparent bits.
>
> Turning now to FIG. 10, sword apparatus 200 is shown in a player's hand 1000 in combat with a virtual sword 1002 and virtual opponent 1004. A virtual sword blade is shown at 1006 as idealized as extending from the

> sword apparatus 200 as may be viewed through virtual reality goggles on a player's 1000 eyes. The opponent's sword 1002 opponent 1004 and opponent sword blade 1008 are, in this example, a virtual representation. The game controller 240 may track the position and attitude of sword apparatus 200. The positional and attitude information may be used by the game controller software to project and track the virtual blade 1006. The game controller software 240 may determine and track the velocity of the blade 1006 by using the differential positioning method described above. The game controller 240 software may also create and track the position of blade 1006 in the game space coordinate system. The game controller 240 may create and track the position of blade 1008. The game controller software may determine when the position information of blade 1006 and the position information of blade 1008 indicates a collision of the blades by tracking the area from line 1014 which has a radius 1018 and the area from line 1016 which has a radius 1020 and logically comparing the points to determine whether there is an intersection. When the game controller software determines there is an intersection the intersection point may be passed to the procedures described above in FIGS. 5, 6 and 7. In summary, a vector 1012 is determined that provides the force of the sword blow, for blade 1006, at the point of intersection. A vector 1010 is also determined providing the force of the attacking sword at the point of intersection. Through the use of the conservation of energy equations provided above, a resultant vector 1022 may be determined to provide the force vector for the resultant force at the point of intersection. The vector 1024 may also be calculated with the conservation of energy equations to provide the resultant force at the intersection point for the attacking sword 1002. The resultant force vector 1022 may be used in conjunction with the distance between the point of intersection and the sword hilt 1026 to approximate the torque generated at the point the player 1000 is gripping the sword apparatus 200. The torque is the distance times the force vector 1022. This torque output approximation may be used, inter alia, by the procedures described above to calculate the output torques and/or toppling force for the propulsion gyrostat.

Woolston at 15:33-16:34

See also, id. at Figs. 9A-B, 10.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"remote processing system, receiving and transmitting data"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

Claim 28

28. A system according to claim 27,

See Claims 1 and 27 above.

28(a) wherein said processing system is adapted to determine movement information for both said first and second communication devices

This limitation is disclosed or suggested by Woolston. For example, Woolston's processing system determines movement information for both the first and second communication devices.

> A network 708 is shown which may be a TCP/IP network such as the Internet. In the master configuration, the game station programmed as the master sends, receives and coordinates the information transfer from the "slave" configured stations. Information may be transferred between the stations using the communication data packet shown in FIG. 9B. The communication packet provides a terminal identification 750, position information for a sword apparatus 752, attitude information for a sword apparatus 754, velocity information for a sword apparatus 756, resultant force vector information 758 and sword parameter information 760. The slave configured game station may periodically send this information packet to the master configured game controller. The master configured game controller may in turn, use this information to generate a virtual opponent having a virtual sword representation that is mapped into the game space. The master configured game station may relay the information from a first slave configured game terminal to a second slave configured game terminal. The master configured game station coordinates the calculation of the resultant force vector for the slave configuration game station's control output. It is understood that data packet shown in 9B may be framed with the suitable protocol overhead and transparent bits.
> Turning now to FIG. 10, sword apparatus 200 is shown in a player's hand 1000 in combat with a virtual sword 1002 and virtual opponent 1004. A virtual sword blade is shown at 1006 as idealized as extending from the sword apparatus 200 as may be viewed through virtual reality goggles on a player's 1000 eyes. The opponent's sword 1002 opponent 1004 and opponent sword blade 1008 are, in this example, a virtual representation. The game controller 240 may track the position and attitude of sword apparatus 200. The positional and attitude information may be used by the game controller software to project and track the virtual blade 1006. The game controller software 240 may determine and track the velocity of the blade 1006 by using the differential positioning method described above. The game controller 240 software may also create and track the position of blade 1006 in the game space coordinate system. The game controller 240 may create and track the position of blade 1008. The game controller software may determine when the position information of blade 1006 and the position information of blade 1008 indicates a collision of the blades by tracking the area from line 1014 which has a radius 1018 and the area from line 1016 which has a radius 1020 and logically comparing the points to determine whether there is an intersection. When the game controller

> software determines there is an intersection the intersection point may be passed to the procedures described above in FIGS. 5, 6 and 7. In summary, a vector 1012 is determined that provides the force of the sword blow, for blade 1006, at the point of intersection. A vector 1010 is also determined providing the force of the attacking sword at the point of intersection. Through the use of the conservation of energy equations provided above, a resultant vector 1022 may be determined to provide the force vector for the resultant force at the point of intersection. The vector 1024 may also be calculated with the conservation of energy equations to provide the resultant force at the intersection point for the attacking sword 1002. The resultant force vector 1022 may be used in conjunction with the distance between the point of intersection and the sword hilt 1026 to approximate the torque generated at the point the player 1000 is gripping the sword apparatus 200. The torque is the distance times the force vector 1022. This torque output approximation may be used, inter alia, by the procedures described above to calculate the output torques and/or toppling force for the propulsion gyrostat.

Woolston at 15:33-16:34

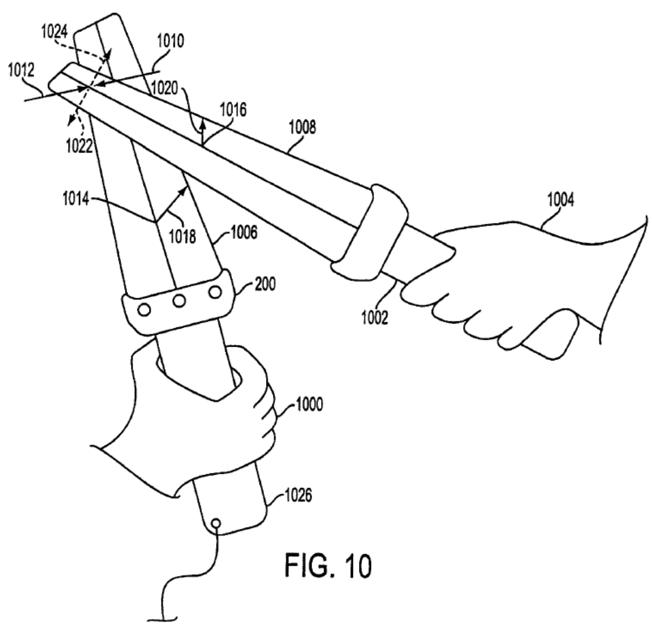

FIG. 10

Id. at Fig. 10

See also, id. at Figs. 5-8, 9A-B, 10:21-15:2.

To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the ***"tracking and processing movement, position, and orientation" and/or "second communication device"*** *references identified in the Invalidity Contentions, which also identify rationale for the combination.*

28(b) and to calculate a displacement vector from said movement information.

This limitation is disclosed or suggested by Woolston. For example, Woolston's processing system calculates a displacement vector from the movement information.

> FIG. 5 shows a block diagram representing a procedure that may be used to calculate a simulated sword blow. This routine may make the initial calculation for the torque force to be applied to the pitch and yaw motor drives at outputs 404 and 406. The calculate blow routine 520 may be called when an "attacking" sword and/or other virtual object(s) comes into contact with the calculated position for the player's virtual embodiment of the sword. The calculate blow routine 520 routine may receive an impact point in the x, y, and z coordinates of the virtual space and when applicable the attacking sword velocity. Block 522 labeled "get position sword hilt" is a routine that may retrieve the actual position of a player's sword apparatus 200 from sensor 600 and/or by the other means of sensors 300, 302 and 304. The retrieved hilt point may be used to determine the distance from the sword hilt that a sword impact occurred. This distance may, in turn, be used to determine the amount of leverage, e.g., the amount of "twisting force", that the attacking sword blow may have on the sword apparatus 200. The next block 524 may calculate the sword's idealized mass. It is understood that more than one type of sword apparatus may be utilized, e.g., sword apparatus with different mass flywheels and/or rotational frequency, thus, the sword's idealized mass may be derived, at least in part, from a variable mass M, which may be the actual mass of the propulsion gyrostat and the variable omega which may be the instantaneous and/or present angular velocity and/or rotational frequency of the propulsion gyrostat. These two parameters may be used to determine the idealized mass and/or angular momentum of the propulsion gyrostat at any give time. Block 526 labeled "get sword velocity vector" may determine the sword velocity vector, e.g., the direction and speed of the sword, by successively determining the position of the player's sword and then determine from the change in position the velocity of the sword apparatus 200. The virtual sword may have an idealized and/or virtual mass that is different from the actual mass and/or inertial mass of the actual apparatus 200. For example, in one configuration the virtual mass may be represented and/or idealized as a heavy broad sword. Since a real broadsword may be a very heavy instrument, its virtual mass may also have a certain amount of momentum because of its idealized weight and velocity. The resultant of procedural blocks 524 and 526 is a vector providing the player's virtual sword direction and force at the impact point. The next procedural block 528 "get game sword position" yields a value from the game software, much like the resultant from procedural blocks described above, which provides the position of the sword hilt from the attacking virtual sword. Block 530 labeled "get game sword velocity vector" is a vector, from the game

> software, providing the velocity and virtual mass of the attacking sword, similar to procedural blocks 524 and 526 described above. Again, for example only, the virtual attacking sword may also have a virtual mass idealized from a fictionalized attacking broad sword. That is, once the heavy broad sword is in "motion", it may have a momentum from its mass and velocity. Procedural block 532 labeled "get game sword blow intensity" is the force of the attacking blow at the position of the strike. This may be calculated by the well known equation that force equals mass times acceleration and/or kinetic energy equals one half the mass times velocity squared. The results of procedural blocks 528, 530 and 532 is a vector providing the direction and force at the impact point of both the attacking virtual sword and the virtual sword projected from the player's sword apparatus 200. By taking the cross product of these vectors, the factors such as angle of the sword attack, how far from the hilt the strike may be taken into account when calculating the resultant vectors. Thus, procedural block 534 labeled "calculated blow/return blow torque vector" is a product of the two vectors, that is, the vector providing the player's sword direction and force at the impact point and the attacking sword vector providing the direction and force of the impact point idealized at right after impact. The product of the two vectors may provide the resulting direction and speed of the two swords by the calculation between two idealized objects when the equation for the conservation of momentum and/or energy is applied. That is m1v1+m2v2=m1v1 (t+1)+m2v2 (t+1). Thus, in this exemplary embodiment of the present invention the two swords may "bounce" off each other with an idealized impact. That is, there is no cushion or elasticity loss in the impact of the two idealized swords. However, elasticity factors as well as other means for calculating the resultant torque from a sword blow are within the scope of the present invention and may be accommodated by the insertion of loss constants in the energy conservative equations.

Id. at 10:21-11:40

> FIG. 7 shows the gyrostat position control procedure 560. The gyrostat position control procedure may be the control loop that controls the output to torque control 404 and 406 and governs the position and/or toppling of the propulsion gyroscope 10. The gyrostat position control procedure may operate in a continuous loop and may be the master routine that takes into account the sword blow torque and the "mysterious force factor", as will be discussed below, and the torque output required to cancel the force of a player rotating the sword apparatus 200 when no torque and/or tactile feedback or output on the sword apparatus 200 is desired. Taking each step in turn, procedural block 562 labeled "initialize position" may provide that when the sword is initially powered on this procedure moves the propulsion gyrostat to an initial position. For example, "toppling" or rotating the propulsion gyrostat to top dead center while it initially spins up. This may be used to initially provision software variables in the game controller 240. Procedural block 564 "get sword position" may be the sword position from block 600 and/or sensors array in the 300 series which may be used to

determine the sword device 200 position. Block 566 may be a wait state that may be used to pause the procedural loop. Procedural block 568 labeled "get sword position" which may be a routine that may be identical to block 564 and may be used to get a second sword position. Procedural block 570 may use the first position from procedural block 564 and the second sword position 568 to calculate the change and/or delta in the sword apparatus 200 position, that is, the change and/or attitude in the position of the sword apparatus 200. Procedural block 572 "get gyro position" may determine, from sensors 408 and 410, the position of the propulsion gyrostat 10. Procedural block 574 may be used to calculate the tracking torque 1 and torque 2, although it is labeled "tracking torque" it may actually be a tracking voltage that topples the propulsion gyrostat to compensate for the change in the sword position from the first sword position calculated at 564 and the second sword position determined at 568. The tracking voltage may be used to topple the propulsion gyrostat in such a way as to track the position of the sword apparatus 200 so as to minimize the torque felt at the sword apparatus 200 in response to movement of the apparatus, e.g., by the player, when no torque is desired. Alternatively, the toppling motors in the relaxed and/or non-energized state in conjunction with any mechanical advantage mechanism used to couple the toppling motors to the propulsion gyrostat flywheel 10, may allow the propulsion gyrostat sufficient freedom of rotation so as to not require the tracking voltage output. However, in certain situations and/or configurations, it may be that if the propulsion gyrostat were to remain fixed and the player moved and/or changed the attitude of the sword apparatus 200, the player may feel an undesired torque at a right angle to the rotational force applied by the player. In this instance, the mechanical linkage, generally denoted in FIG. 2, may provide a predetermined mechanical degree of freedom in the coupling of the toppling motors with the propulsion flywheel 10. The predetermined degree of freedom may be used by the gyrostat position control routine 560 to provide a delay and/or predetermined degree of mechanical freedom to allow the calculation of the tracking voltages from block 574 to rotate and/or to allow the propulsion gyrostat to rotate and track the player's movement of the sword apparatus 200 without the player receiving an untoward amount of undesirable tactile feedback. The tracking voltage calculation may only be an approximate calculation and yet be a mitigating factor for undesirable torque effect, e.g., some residual torque felt by the player may actually add a desirable strangeness of the tactical feel of the sword apparatus 200. The next procedural block 580 labeled "get gyro effects" accesses the torque calculated for the sword blow, from FIG. 6, at the circular block 576 and accesses the mysterious force torque, as will be discussed below in FIG. 8, at block 578. Procedural block 580 "get gyro effects" calculates the sum of the tracking voltages from block 574, the sword blow torque from FIG. 6 and the mysterious force torque from FIG. 8 to combine these three torque vectors to determine a tracking voltage and/or voltages to create the toppling torque for the propulsion gyrostat 10. Block 582 outputs torque voltages 1 and torque voltages 2 to torque motor controllers 404 and 406. These torque

> voltages are used to topple the propulsion gyrostat 10 of the present invention to provide the gyrostatic effect of the sword apparatus 200. Thus, for example, when the virtual sword is not impacting on a virtual object the output at block 582 may merely be the tracking torques from block 574 that attempts to topple the propulsion gyrostat so as to track the player's movement of sword apparatus 200. Thus, for example, when a sword blow torque is generated from the procedure described in FIG. 6, the dominant factor in the gyro effects calculation 580 and, therefore, the output at 582 may be the sword blow providing a strong output providing a strong torque at the sword apparatus 200. In a third example situation, the dominant force may be the "mysterious" force from FIG. 8, which will be discussed further below, which attempts to lead the player's sword movement through what may be subtle torque on the sword apparatus 200. The "mystery" torque may be strong or subtle on sword apparatus 200 depending on pre-programmed parameters.

Id. at 12:46-14:10.

> FIG. 8 shows the "mysterious" force calculation at procedural block 590. For example, the mysterious force in the light saber metaphor may be a fanciful force as fictionalized in the Star Wars™ story line that the sword apparatus 200 will actually lead the player to a future sword impact. Another use of the "mysterious" force may be for a swordsman training mode to teach sword fighting techniques. The mysterious force calculation may be performed at procedural block 591 by first getting a desired virtual x, y, and z point for the virtual sword. Thus, the game software provides this coordinate as it, by definition, is a point and/or coordinate wherein an game event will occur within the game domain's future. Procedural block 592 may determine the sword apparatus 200 base point, as discussed above, from sensors 600 gyrostatic determination and/or sensors 300 external determination. The base point is understood to be the hilt of the sword apparatus 200 and/or the sword handle of sword apparatus 200. Procedural block 593 may get the sword position or attitude, e.g., the angular position of the sword apparatus 200 and, thus, may determine the virtual location of the virtual sword blade extending from the sword apparatus 200. Procedural block 594 may calculate the smallest change in position of the virtual sword location to the game provided X, Y and Z coordinates, e.g., some "future event." Procedural block 595 may calculate a torque for the necessary pitch and yaw for the propulsion gyrostat, which may calculate a torque to move the virtual sword to intersect the desired X, Y and Z coordinate and/or provide a torque in the direction of the desired X, Y, and Z coordinates. Block 596 is the mysterious force factor parameter which may be a constant that is multiplied by the torque from block 595 to provide a mysterious force that is either strong, if the mysterious force factor is a large number, or subtle if the mysterious force factor is a small constant. The game metaphor and/or plot line may be adapted to provide the player additional incentive to have a subtle mysterious force factor, again, to coordinate the game play and/or the plot with the conservation of the angular momentum of the

> propulsion gyrostat. The next procedural block 597 may output a torque for controllers 404 and 406 to the gyro position control procedure depicted in FIG. 7. It is understood that this torque calculation may take into account the position of the propulsion gyrostat from sensor circuits 408 and 410 as well as the angular momentum of the propulsion gyrostat from sensor circuit 414 and as well as taking into account the mass factors from the controller for the particular propulsion gyrostat used by the particular sword apparatus 200. Procedural block 597 may output the mysterious force torque via a memory location or other suitable buffer structure back to FIG. 7 as previously discussed.

Id. at 14:20-15:2.

> A network 708 is shown which may be a TCP/IP network such as the Internet. In the master configuration, the game station programmed as the master sends, receives and coordinates the information transfer from the "slave" configured stations. Information may be transferred between the stations using the communication data packet shown in FIG. 9B. The communication packet provides a terminal identification 750, position information for a sword apparatus 752, attitude information for a sword apparatus 754, velocity information for a sword apparatus 756, resultant force vector information 758 and sword parameter information 760. The slave configured game station may periodically send this information packet to the master configured game controller. The master configured game controller may in turn, use this information to generate a virtual opponent having a virtual sword representation that is mapped into the game space. The master configured game station may relay the information from a first slave configured game terminal to a second slave configured game terminal. The master configured game station coordinates the calculation of the resultant force vector for the slave configuration game station's control output. It is understood that data packet shown in 9B may be framed with the suitable protocol overhead and transparent bits.
>
> Turning now to FIG. 10, sword apparatus 200 is shown in a player's hand 1000 in combat with a virtual sword 1002 and virtual opponent 1004. A virtual sword blade is shown at 1006 as idealized as extending from the sword apparatus 200 as may be viewed through virtual reality goggles on a player's 1000 eyes. The opponent's sword 1002 opponent 1004 and opponent sword blade 1008 are, in this example, a virtual representation. The game controller 240 may track the position and attitude of sword apparatus 200. The positional and attitude information may be used by the game controller software to project and track the virtual blade 1006. The game controller software 240 may determine and track the velocity of the blade 1006 by using the differential positioning method described above. The game controller 240 software may also create and track the position of blade 1006 in the game space coordinate system. The game controller 240 may create and track the position of blade 1008. The game controller software may determine when the position information of blade 1006 and the position information of blade 1008 indicates a collision of the blades by

> tracking the area from line 1014 which has a radius 1018 and the area from line 1016 which has a radius 1020 and logically comparing the points to determine whether there is an intersection. When the game controller software determines there is an intersection the intersection point may be passed to the procedures described above in FIGS. 5, 6 and 7. In summary, a vector 1012 is determined that provides the force of the sword blow, for blade 1006, at the point of intersection. A vector 1010 is also determined providing the force of the attacking sword at the point of intersection. Through the use of the conservation of energy equations provided above, a resultant vector 1022 may be determined to provide the force vector for the resultant force at the point of intersection. The vector 1024 may also be calculated with the conservation of energy equations to provide the resultant force at the intersection point for the attacking sword 1002. The resultant force vector 1022 may be used in conjunction with the distance between the point of intersection and the sword hilt 1026 to approximate the torque generated at the point the player 1000 is gripping the sword apparatus 200. The torque is the distance times the force vector 1022. This torque output approximation may be used, inter alia, by the procedures described above to calculate the output torques and/or toppling force for the propulsion gyrostat. The above described procedures often use vectors and Cartesian coordinates to describe the present invention. Other coordinate systems such as spherical and cylindrical are also within the scope of the present invention.

Id. at 15:34-16:38.

See also, id. at Figs. 5, 7, 8, 9B, 10.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"remote processing system, receiving and transmitting data" and/or "displacement/reference vector"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

Claim 29

29. A system according to claim 28, wherein said processing system is adapted to compare said calculated displacement vector to a reference vector position and to calculate a numerical result.

See Claims 1, 27, and 28 above.

This limitation is disclosed or suggested by Woolston. For example, Woolston's processing system compares the calculated displacement vector to a reference vector position and calculates a numerical result.

> Turning now to FIG. 10, sword apparatus 200 is shown in a player's hand 1000 in combat with a virtual sword 1002 and virtual opponent 1004. A virtual sword blade is shown at 1006 as idealized as extending from the sword apparatus 200 as may be viewed through virtual reality goggles on a player's 1000 eyes. The opponent's sword 1002 opponent 1004 and opponent sword blade 1008 are, in this example, a virtual representation. The game controller 240 may track the position and attitude of sword apparatus 200. The positional and attitude information may be used by the game controller software to project and track the virtual blade 1006. The game controller software 240 may determine and track the velocity of the blade 1006 by using the differential positioning method described above. The game controller 240 software may also create and track the position of blade 1006 in the game space coordinate system. The game controller 240 may create and track the position of blade 1008. The game controller software may determine when the position information of blade 1006 and the position information of blade 1008 indicates a collision of the blades by tracking the area from line 1014 which has a radius 1018 and the area from line 1016 which has a radius 1020 and logically comparing the points to determine whether there is an intersection. When the game controller software determines there is an intersection the intersection point may be passed to the procedures described above in FIGS. 5, 6 and 7. In summary, a vector 1012 is determined that provides the force of the sword blow, for blade 1006, at the point of intersection. A vector 1010 is also determined providing the force of the attacking sword at the point of intersection. Through the use of the conservation of energy equations provided above, a resultant vector 1022 may be determined to provide the force vector for the resultant force at the point of intersection. The vector 1024 may also be calculated with the conservation of energy equations to provide the resultant force at the intersection point for the attacking sword 1002. The resultant force vector 1022 may be used in conjunction with the distance between the point of intersection and the sword hilt 1026 to approximate the torque generated at the point the player 1000 is gripping the sword apparatus 200. The torque is the distance times the force vector 1022. This torque output approximation may be used, inter alia, by the procedures described above to calculate the output torques and/or toppling force for the propulsion gyrostat. The above described procedures often use vectors and Cartesian coordinates to describe the present invention. Other coordinate systems such as spherical and cylindrical are also within the scope of the present invention.

Id. at 15:58-16:38.

See also, id. at Figs. 5, 7, 8, 9B, 10; 12:46-14:10, 14:20-15:2.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"displacement/reference vector"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

Claim 30

30. A system according to claim 29, wherein said processing system sends feedback signals to said first communication device based on said numerical result.

See Claims 1, 27-29 above.

This limitation is disclosed or suggested by Woolston. For example, Woolston's processing system sends feedback signals to the first communication device based on the numerical result.

> Turning now to FIG. 10, sword apparatus 200 is shown in a player's hand 1000 in combat with a virtual sword 1002 and virtual opponent 1004. A virtual sword blade is shown at 1006 as idealized as extending from the sword apparatus 200 as may be viewed through virtual reality goggles on a player's 1000 eyes. The opponent's sword 1002 opponent 1004 and opponent sword blade 1008 are, in this example, a virtual representation. The game controller 240 may track the position and attitude of sword apparatus 200. The positional and attitude information may be used by the game controller software to project and track the virtual blade 1006. The game controller software 240 may determine and track the velocity of the blade 1006 by using the differential positioning method described above. The game controller 240 software may also create and track the position of blade 1006 in the game space coordinate system. The game controller 240 may create and track the position of blade 1008. The game controller software may determine when the position information of blade 1006 and the position information of blade 1008 indicates a collision of the blades by tracking the area from line 1014 which has a radius 1018 and the area from line 1016 which has a radius 1020 and logically comparing the points to determine whether there is an intersection. When the game controller software determines there is an intersection the intersection point may be passed to the procedures described above in FIGS. 5, 6 and 7. In summary, a vector 1012 is determined that provides the force of the sword blow, for blade 1006, at the point of intersection. A vector 1010 is also determined providing the force of the attacking sword at the point of intersection. Through the use of the conservation of energy equations provided above, a resultant vector 1022 may be determined to provide the force vector for the resultant force at the point of intersection. The vector 1024 may also be calculated with the conservation of energy equations to provide the resultant force at the intersection point for the attacking sword 1002. The resultant force vector 1022 may be used in conjunction with the distance between the point of intersection and the sword hilt 1026 to approximate the torque generated at the point the player 1000 is gripping the sword apparatus 200. The torque is the distance times the force vector 1022. This torque output approximation may be used, inter alia, by the procedures described above

> to calculate the output torques and/or toppling force for the propulsion gyrostat. The above described procedures often use vectors and Cartesian coordinates to describe the present invention. Other coordinate systems such as spherical and cylindrical are also within the scope of the present invention.

Id. at 15:58-16:38.

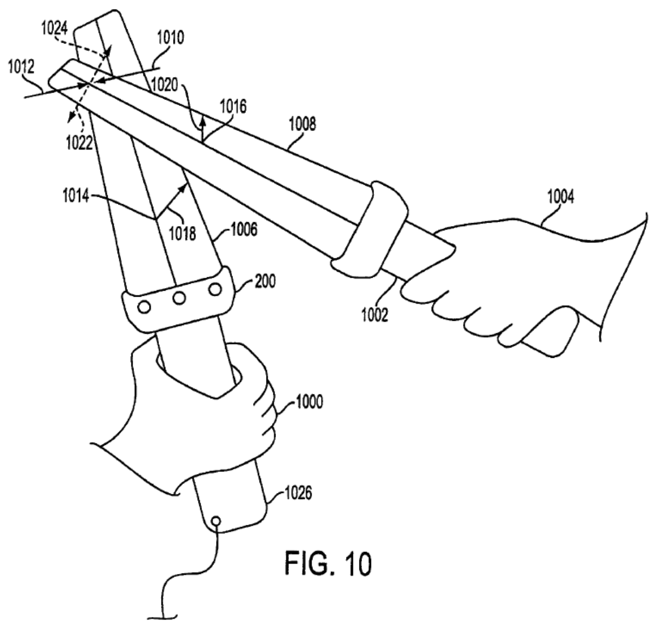

FIG. 10

Id. at Fig. 10.

See also, id. at Figs. 5, 7, 8; 12:46-14:10, 14:20-15:2.

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"displacement/reference vector" and/or "feedback data"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

Claim 32

32 A system according to claim 27,

See Claims 1 and 27 above.

32(a) wherein said processing system is adapted to determine movement information for both said first and second communication devices

See Claims 28(a).

*To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the **"remote processing system, receiving, and transmitting data" and/or "second communication device"** references identified in the Invalidity Contentions, which also identify rationale for the combination.*

32(b) and wherein a vector is calculated and compared to a desired reference vector to calculate a numerical result

Woolston's processing system calculates a vector and compares it to a desired reference vector to calculate a numerical result.

> Another interesting aspect of the present invention is the ability of the software to lead the players movements as well as provide impact feedback. A good example of this would be, again, the Star Wars™ metaphor where the player is told to "feel the force." The game of the present invention may apply a "mysterious force", discussed further below, which is essentially a small torque from the propulsion gyrostat whereby the sword device may "lead" the player's sword blows and/or movement.

Id. at 4:66-5:7.

> FIG. 8 shows the "mysterious" force calculation at procedural block 590. For example, the mysterious force in the light saber metaphor may be a fanciful force as fictionalized in the Star Wars™ story line that the sword apparatus 200 will actually lead the player to a future sword impact. Another use of the "mysterious" force may be for a swordsman training mode to teach sword fighting techniques. The mysterious force calculation may be performed at procedural block 591 by first getting a desired virtual x, y, and z point for the virtual sword. Thus, the game software provides this coordinate as it, by definition, is a point and/or coordinate wherein an game event will occur within the game domain's future. Procedural block 592 may determine the sword apparatus 200 base point, as discussed above, from sensors 600 gyrostatic determination and/or sensors 300 external determination. The base point is understood to be the hilt of the sword apparatus 200 and/or the sword handle of sword apparatus 200. Procedural block 593 may get the sword position or attitude, e.g., the angular position of the sword apparatus 200 and, thus, may determine the virtual location of the virtual sword blade extending from the sword apparatus 200. Procedural block 594 may calculate the smallest change in position of the virtual sword location to the game provided X, Y and Z coordinates, e.g., some "future event." Procedural block 595 may calculate a torque for the necessary pitch and yaw for the propulsion gyrostat, which may calculate a torque to move the virtual sword to intersect the desired X, Y and Z coordinate and/or provide a torque in the direction of the desired X, Y, and Z coordinates. Block 596 is the mysterious force factor parameter which may be a constant that is multiplied by the torque from block 595 to provide a mysterious force

> that is either strong, if the mysterious force factor is a large number, or subtle if the mysterious force factor is a small constant. The game metaphor and/or plot line may be adapted to provide the player additional incentive to have a subtle mysterious force factor, again, to coordinate the game play and/or the plot with the conservation of the angular momentum of the propulsion gyrostat. The next procedural block 597 may output a torque for controllers 404 and 406 to the gyro position control procedure depicted in FIG. 7. It is understood that this torque calculation may take into account the position of the propulsion gyrostat from sensor circuits 408 and 410 as well as the angular momentum of the propulsion gyrostat from sensor circuit 414 and as well as taking into account the mass factors from the controller for the particular propulsion gyrostat used by the particular sword apparatus 200. Procedural block 597 may output the mysterious force torque via a memory location or other suitable buffer structure back to FIG. 7 as previously discussed.

Id. at 14:20-15:2.

See also, id. at Figs. 5, 7, 8, 9B, 10; 12:46-14:10, 15:58-16:38.

To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the ***"displacement/reference vector"*** *references identified in the Invalidity Contentions, which also identify rationale for the combination.*

32(c) and wherein said processing system sends feedback signals to said first communication device based on said numerical result,

See Claim 30.

To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the ***"displacement/reference vector" and/or "feedback data"*** *references identified in the Invalidity Contentions, which also identify rationale for the combination.*

32(d) said first communication device further comprised of an output device for providing feedback stimuli to the user in response to said received feedback signals.

See Claim 1(a)(iii) and 1(c)(ii).

To the extent that this limitation is not fully disclosed or suggested by the art cited above, this limitation would have been obvious to a person of ordinary skill in the art in combination with any of the ***"output device, providing sensory stimuli"*** *references identified in the Invalidity Contentions, which also identify rationale for the combination.*